

Solutions (TRC). Oncor, AEP Texas and representatives from Halff and TRC can provide information concerning particular areas of expertise as they relate to the proposed project. The stations are arranged in a particular order that will, if visited in order, give a better understanding of the Proposed Transmission Line Project. Please spend as much time as you need at each station to have your questions answered or address any issues you may have. Since this is an informal open house, come-and-go type meeting, there may be times when one particular exhibit is crowded. Please bear with us and we will make every attempt to answer any questions you may have in as timely a manner as possible.

### **Who is Oncor?**

Oncor is an electric transmission and distribution utility regulated by the Public Utility Commission of Texas (PUC). As Texas' largest electric utility, Oncor constructs, owns, and operates many of the transmission and distribution lines that move electric power between points of the electric transmission and distribution system, connecting electric power producers with electric power consumers. Oncor does not own power plants or buy or sell electric power.

### **Who is AEP Texas?**

AEP Texas is connected to and serves more than one million electric consumers in the deregulated Texas Marketplace. As an energy delivery wires company (transmission and distribution), AEP Texas delivers electricity safely and reliably to homes, businesses and industry across its nearly 100,000 square mile service territory in south and west Texas. AEP Texas uses the services of its affiliate AEP Transmission to build and operate its transmission network. AEP Transmission builds and operates transmission infrastructure for the AEP Operating Companies and other power companies that distribute it to businesses and homes. AEP Transmission now operates more than 40,000 miles of transmission network.

### **What does the transmission system do?**

The State of Texas' electric system is a network of power generation facilities, transmission lines, switching stations and substations, and distribution lines designed to provide reliable electric service to retail

customers. Transmission lines generally carry, or transport, electricity from power generation facilities at a high voltage to substations where electricity is converted to a lower voltage that the distribution lines carry to residences and businesses.

In order for Oncor and AEP Texas to continue to provide reliable electric service, they must work with other utilities and state organizations to ensure that the electric transmission network is designed so that the temporary loss of a power generation facility, a substation, or a transmission line will not result in a major electric outage. For example, without appropriate planning and subsequent system improvements, damage to a single transmission line due to weather or equipment failure could result in significant disruptions in the delivery of electricity.

### **Why must a new transmission line be constructed in this area?**

The Delaware Basin area of West Texas continues to experience strong growth in electricity usage due to increasing oil and natural gas production and mid-stream processing as well as supporting industrial, commercial, and residential development. Ongoing assessment of the existing 138 kV facilities serving Ward, Winkler, Loving, Reeves, and Culberson Counties has identified the need for additional system reliability and operability improvements in this region, resulting in project endorsement by the Electric Reliability Council of Texas as critical to the reliability of the transmission system. Currently, the electricity needs for this region are served by the 75-mile 138 kV line that extends from the Wink Switching Station near Wink to the Culberson Substation in Culberson County and the 94-mile 138 kV line that extends from the Yucca Drive Switching Station near the Permian Basin Generation Plant to the Culberson Switching Station in Culberson County. Oncor has continued to receive numerous load additions along these transmission lines, causing existing and soon-to-be-completed projects in the area to be insufficient to serve the increasing use of electricity in the area when system outages occur. An additional pathway for a stronger voltage such as 345 kV is needed to ensure system strength and resiliency. Construction of the Proposed Transmission Line Project will provide a new 345 kV source to the area, which will strengthen the



transmission system so it can serve the additional need for electricity and ensure long term reliability for the area.

**What is the approximate location of the proposed transmission line?**

The approximate locations of proposed alternative transmission line routes are shown on the attached location map (Exhibit 1).

**How long will the transmission line be?**

The straight-line distance between project endpoints is approximately 40 miles. However, the transmission line could be approximately 44 to 80 miles long depending on the route that is ultimately approved, or “certificated”, by the PUC.

**What type of transmission structure will be used?**

Oncor and AEP Texas continually evaluates different transmission structure types to satisfy specific project requirements such as transmission line voltage, double or single circuit, cost, physical location, and characteristics of the surrounding land area to name a few. For the Proposed Transmission Line Project, Oncor and AEP Texas have chosen a self-supporting, steel lattice tower structure. A drawing of the standard double circuit 345 kV steel lattice tangent tower structure that is proposed for use in this project is attached (Exhibit 2 – Oncor, and Exhibit 3 - AEP Texas).

**Who will benefit from the new transmission line?**

The completion of this transmission line project will provide benefits to all participants in the Texas electric market, including end-use consumers of electricity in the Ward, Reeves, and Pecos County areas. The proposed enhancements will improve the electric system to continue the reliable electric service consumers have come to expect from Oncor and AEP Texas as well as add important necessary transmission capacity to support the continuing development and economic growth of the local communities in these areas.

**Will environmental studies be conducted to determine the impact of the project?**

Yes. Halff, an environmental consulting and engineering firm in Dallas with environmental expertise, is preparing an Environmental Assessment and Alternative Route Analysis to support an Application for a Certificate of Convenience and Necessity (CCN) from the PUC. The Environmental Assessment and Alternative Route Analysis will include a compilation of the impacts of the alternative transmission line routes to the existing environment and land uses.

**How will property owners or other interested persons find out information regarding the status of the Oncor and AEP Texas project and the results of the certification process?**

There are several ways members of the public may: (1) be made aware of Oncor's and AEP Texas' filing of its CCN application at the PUC; (2) participate or provide comment in the certification process; (3) monitor the proceeding as it progresses; and (4) determine the results of the PUC's action regarding the Proposed Transmission Line Project.

First, a formal notice will be provided (via first class mail) to any property owner whose land will be crossed by any alternative route for the Proposed Transmission Line Project filed by Oncor and AEP Texas as part of the formal application for approval to construct the project. In addition, a formal notice will also be provided (via first class mail) to any property owner who has a habitable structure within 500 feet of the centerline of any of the proposed alternative routes for the Proposed Transmission Line Project. Property ownership for this notice is determined by research of the appropriate county appraisal district tax records.

Second, public notice will be provided in newspapers of general circulation within the appropriate counties during the week following the filing of Oncor's and AEP Texas' application at the PUC.

Information about Oncor's and AEP Texas' application, and the proceedings at the PUC, can be obtained on the PUC's online filings Interchange. The PUC's website provides free access to documents

that are officially filed with the PUC. The docket number (also called a control number on the PUC website) of a case is a key piece of information used in locating documents in the case. The docket number will be available once Oncor and AEP Texas file the CCN application with the PUC, and it will be provided in the mailed and published notices. You may access the Interchange by visiting the PUC's website at [www.puc.state.tx.us](http://www.puc.state.tx.us).

One way to become involved in a case before the Commission is as an "intervenor." An intervenor is a person who, upon showing a justiciable interest, is permitted to become a party to the proceeding. Intervenors are full participants in the proceeding and can make legal arguments, conduct discovery, file testimony, cross-examine witnesses, and are themselves, if they testify, subject to cross-examination by the other parties in the case. For more information and rules about participating as an intervenor, visit the PUC's website at: <http://www.puc.texas.gov/agency/rulesnlaws/Participate.aspx>.

If you do not wish to be a full participant in this proceeding, you may become a "protestor." Protestors are not parties to the case and may not conduct discovery, cross-examine witnesses or present a direct case. Protestors may, however, make a written or verbal statement in support of or in opposition to the application and give information to the PUC staff that they believe may be helpful. If you intend to be a protestor, you can either send written comments stating your position regarding the application, or if the docket progresses to a hearing, a statement of protest can be made on the first day of hearing, as allowed. Although public comments are not sworn and therefore not treated as evidence, they help to inform the PUC and its staff of the public's concerns and to identify issues to be explored. The PUC welcomes such participation in its proceedings.

Finally, if a route for the Proposed Transmission Line Project is approved by the PUC, a notice (via first class mail) will be sent to the property owners who were provided formal notice of the filing of Oncor's and AEP Texas' application at the PUC indicating the issuance of a Final Order by the PUC and that their property is either affected by the approved routing, or that their property is no longer affected by the Proposed Transmission Line Project.

**When will construction of the proposed transmission line begin?**

Before construction can begin, Oncor and AEP Texas must seek and receive approval from the PUC. This process, along with typical time frames for each step of the process, is provided in the attached **Licensing Process for New Transmission Facilities**. Based on an in-service date of 2020, Oncor and AEP Texas anticipate filing its application in 2018 and, if approved, anticipate construction could begin as early as 2019.

**If I have additional questions following this meeting, who should I contact?**

Additional information concerning this and other Oncor transmission line projects can be obtained at the following website: <http://www.oncor.com/transmissionprojects>. You may also contact Mr. Chris Reily of Oncor at (214) 486-4717, Randal Roper of AEP Texas at (512) 565-9107, or Oncor via email at [transmissionprojects@oncor.com](mailto:transmissionprojects@oncor.com) and AEP Texas via email at [reroper@aep.com](mailto:reroper@aep.com).

**Thank you again for attending this open house!**

THIS PAGE LEFT BLANK INTENTIONALLY

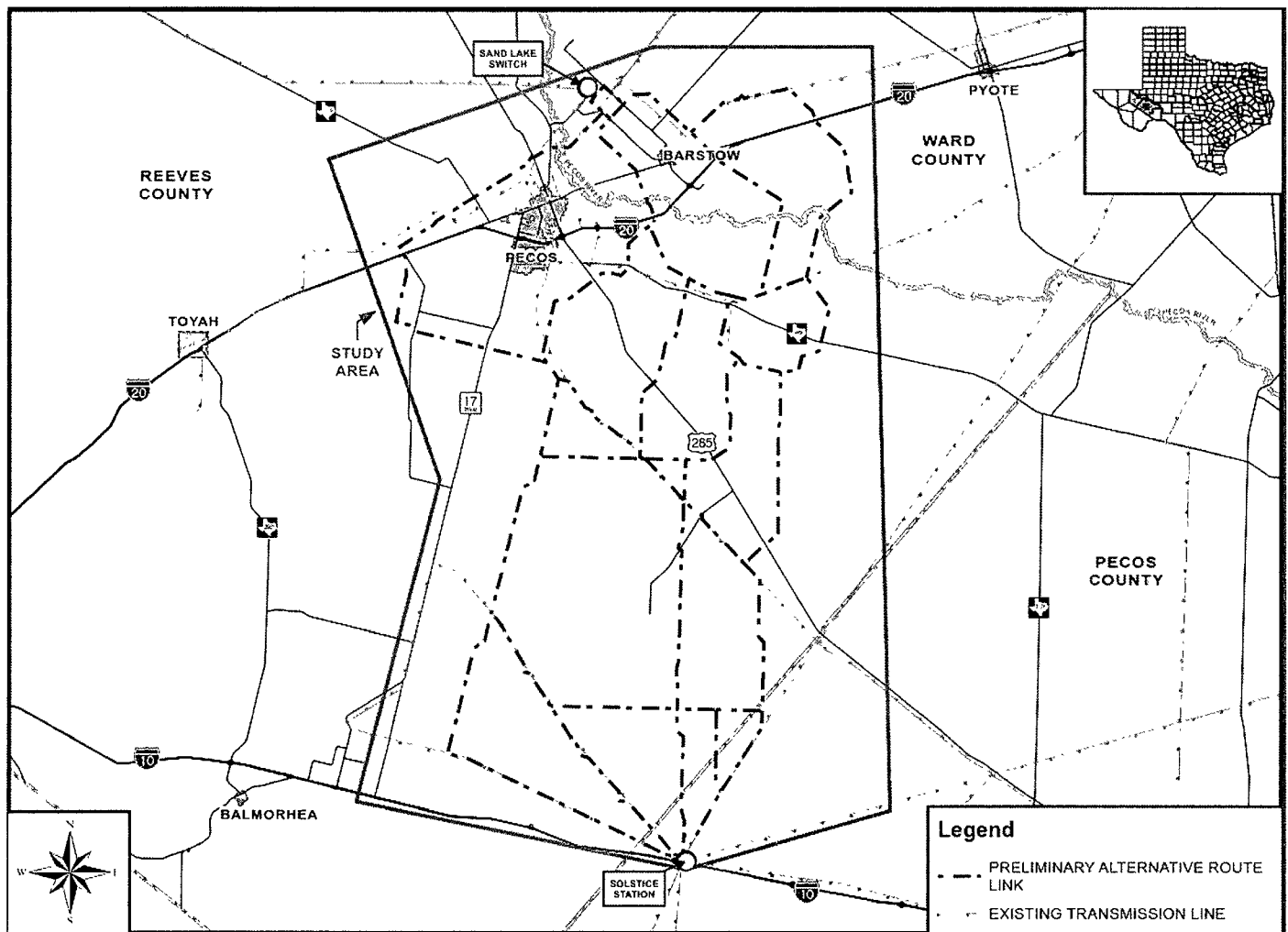
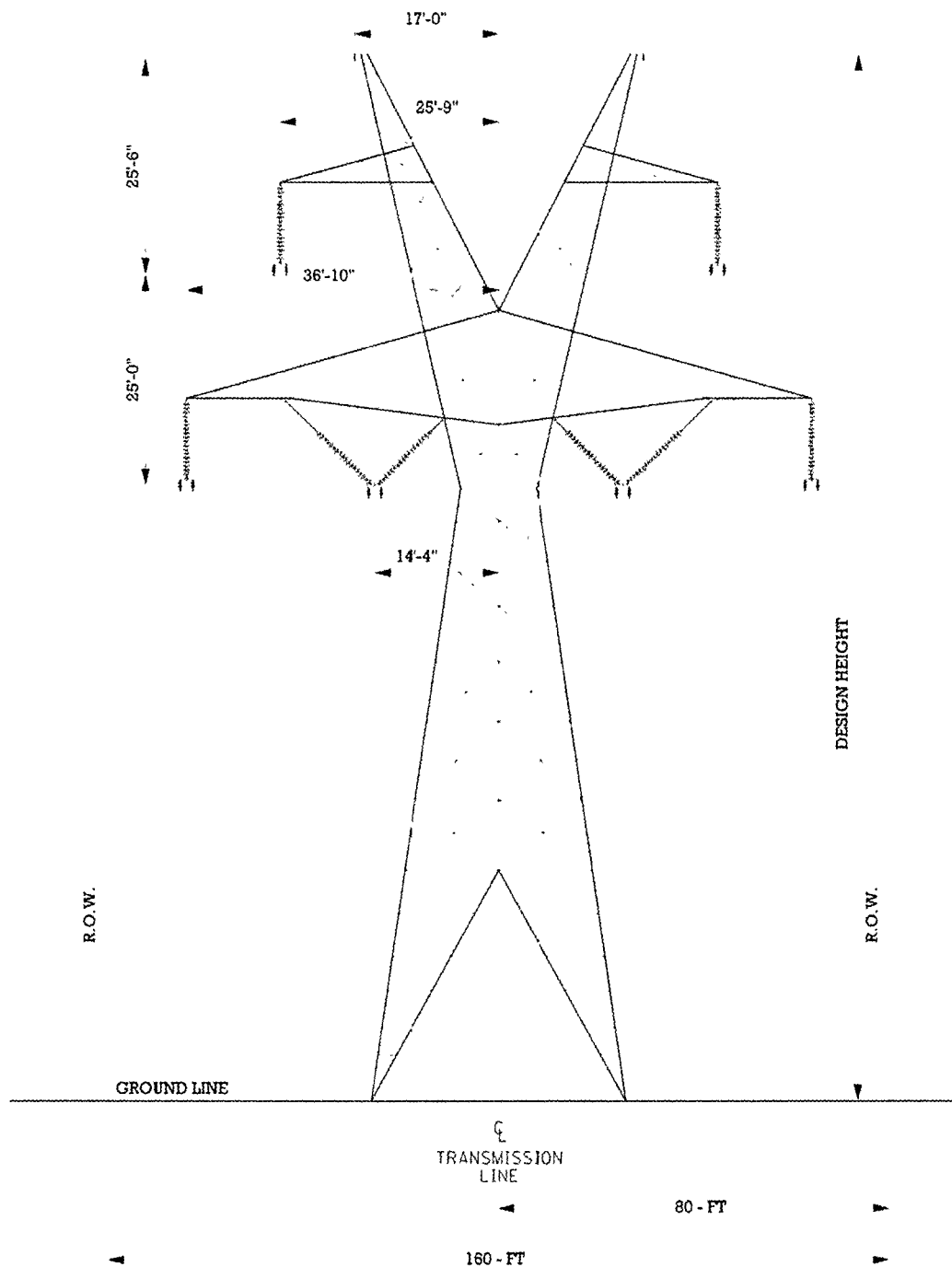


EXHIBIT 1



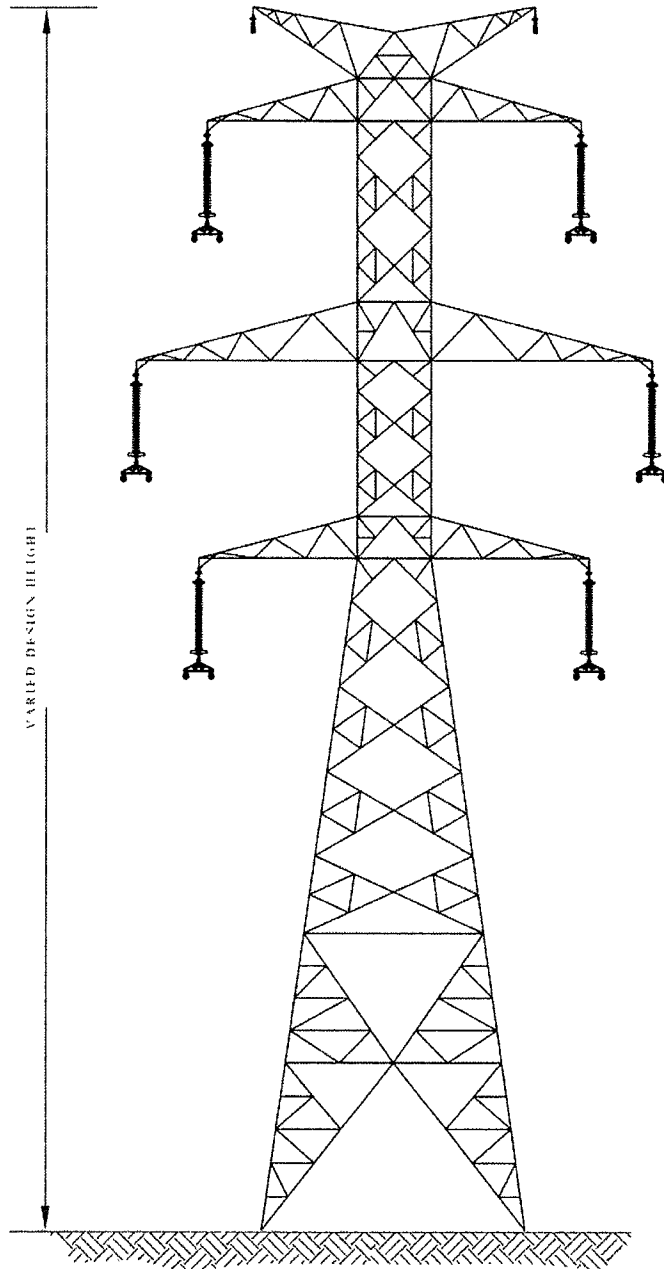
**TYPICAL 345 KV TANGENT DOUBLE  
CIRCUIT "V" TOWER**

**Exhibit 2**



# TYPICAL TANGENT DOUBLE CIRCUIT 345-KV STRUCTURE DESIGN

---



**Max Easement Width**  
160 feet

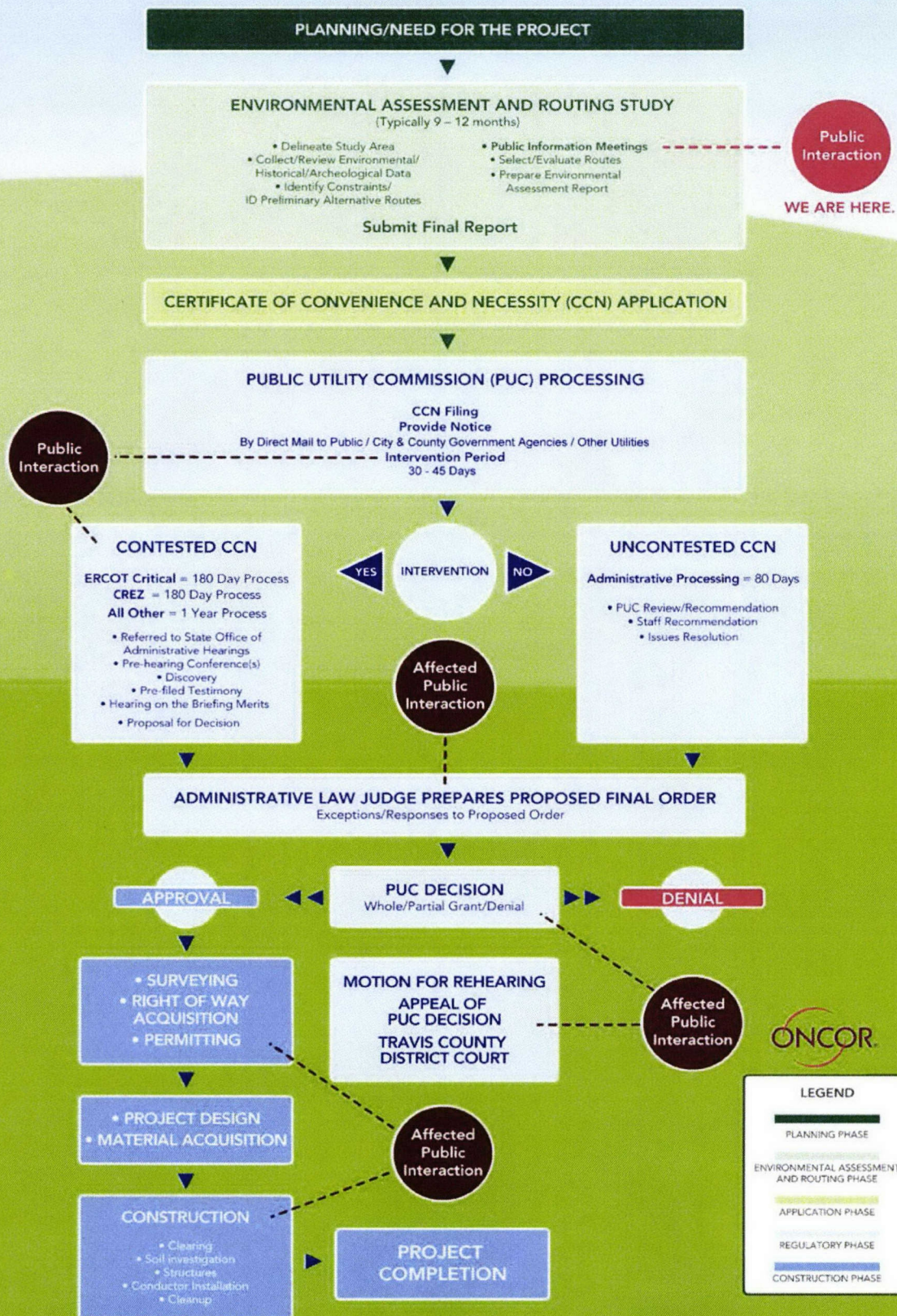
**Structure Material**  
Galvanized steel



**Exhibit 3**



# Licensing Process for New Transmission Facilities





# Licensing Process for New Transmission Facilities

## **Texas Utilities Code**

The governance of the licensing process for new transmission facilities is included within the Texas Utilities Code, Title II – Public Utilities Regulatory Act, Section 37.056.

### **Sec 37.056 GRANT OR DENIAL OF CERTIFICATE**

- (a) The commission may approve applications and grant a certificate only if the commission finds that the certificate is necessary for the service, accommodation, convenience, or safety of the public.
- (b) The commission may:
  - (1) issue the certificate as requested;
  - (2) grant the certificate for the construction of a portion of the requested system, facility, or extension or the partial exercise of the requested right or privilege; or
  - (3) refuse to grant the certificate.
- (c) The commission shall grant each certificate on a nondiscriminatory basis after considering:
  - (1) the adequacy of existing service;
  - (2) the need for additional service;
  - (3) the effect of granting the certificate on the recipient of the certificate and on any electric utility serving the proximate area; and
  - (4) other factors, such as;
    - (A) community values;
    - (B) recreational and park areas;
    - (C) historical and aesthetic values;
    - (D) environmental integrity; and
    - (E) the probable improvement of service or lowering of cost to consumers in the area if the certificate is granted.

If you have additional questions or would like additional information, you may contact the Public Utility Commission of Texas at P.O. Box 13326, Austin, Texas 78711-3326, or call the Public Utility Commission at (512) 936-7120, or (888) 782-8477. Hearing impaired and speech-impaired individuals with text telephones may contact the commission at (512) 936-7136.

09/2011

THIS PAGE LEFT BLANK INTENTIONALLY



---

THE STATE OF TEXAS  
LANDOWNER'S  
BILL OF RIGHTS

---

PREPARED BY THE



OFFICE OF THE  
ATTORNEY GENERAL OF TEXAS



## STATE OF TEXAS LANDOWNER'S BILL OF RIGHTS

---

This Landowner's Bill of Rights applies to any attempt by the government or a private entity to take your property. The contents of this Bill of Rights are prescribed by the Texas Legislature in Texas Government Code Sec. 402.031 and Chapter 21 of the Texas Property Code.

1. You are entitled to receive adequate compensation if your property is taken for a public use.
2. Your property can only be taken for a public use.
3. Your property can only be taken by a governmental entity or private entity authorized by law to do so.
4. The entity that wants to take your property must notify you that it wants to take your property.
5. The entity proposing to take your property must provide you with a written appraisal from a certified appraiser detailing the adequate compensation you are owed for your property.
6. The entity proposing to take your property must make a bona fide offer to buy the property before it files a lawsuit to condemn the property – which means the condemning entity must make a good faith offer that conforms with Chapter 21 of the Texas Property Code.
7. You may hire an appraiser or other professional to determine the value of your property or to assist you in any condemnation proceeding.
8. You may hire an attorney to negotiate with the condemning entity and to represent you in any legal proceedings involving the condemnation.
9. Before your property is condemned, you are entitled to a hearing before a court appointed panel that includes three special commissioners. The special commissioners must determine the amount of compensation the condemning entity owes for the taking of your property. The commissioners must also determine what compensation, if any, you are entitled to receive for any reduction in value of your remaining property.
10. If you are unsatisfied with the compensation awarded by the special commissioners, or if you question whether the taking of your property was proper, you have the right to a trial by a judge or jury. If you are dissatisfied with the trial court's judgment, you may appeal that decision.

## CONDEMNATION PROCEDURE

---

Eminent domain is the legal authority that certain entities are granted that allows those entities to take private property for a public use. Private property can include land and certain improvements that are on that property.

Private property may only be taken by a governmental entity or private entity that is authorized by law to do so. Your property may be taken only for a public purpose. That means it can only be taken for a purpose or use that serves the general public. Texas law prohibits condemnation authorities from taking your property to enhance tax revenues or foster economic development.

Your property cannot be taken without adequate compensation. Adequate compensation includes the market value of the property being taken. It may also include certain damages if your remaining property's market value is diminished by the acquisition itself or by the way the condemning entity will use the property.

## HOW THE TAKING PROCESS BEGINS

---

The taking of private property by eminent domain must follow certain procedures. First, the entity that wants to condemn your property must provide you a copy of this Landowner's Bill of Rights before - or at the same time - the entity first represents to you that it possesses eminent domain authority.

Second, if it has not been previously provided, the condemning entity must send this Landowner's Bill of Rights to the last known address of the person who is listed as the property owner on the most recent tax roll. This requirement stipulates that the Landowner's Bill of Rights must be provided to the property owner at least seven days before the entity makes a final offer to acquire the property.

Third, the condemning entity must make a bona fide offer to purchase the property. The requirements for a bona fide offer are contained in Chapter 21 of the Texas Property Code. At the time a purchase offer is made, the condemning entity must disclose any appraisal reports it produced or acquired that relate specifically to the property and were prepared in the ten years preceding the date of the purchase offer. You have the right to discuss the offer with others and to either accept or reject the offer made by the condemning entity.

## CONDEMNATION PROCEEDINGS

---

If you and the condemning entity do not agree on the value of your property, the entity may begin condemnation proceedings. Condemnation is the legal process that eligible entities utilize to take private property. It begins with a condemning entity filing a claim for your property in court. If you live in a county where part of the property being condemned is located, the claim must be filed in that county. Otherwise, the condemnation claim can be filed in any county where at least part of the property being condemned is located. The claim must describe the property being condemned, state with specificity the public use, state the name of the landowner, state that the landowner and the condemning entity were unable to agree on the value of the property, state that the condemning entity provided the landowner with the Landowner's Bill of Rights, and state that the condemning entity made a bona fide offer to acquire the property from the property owner voluntarily.

## SPECIAL COMMISSIONERS' HEARING

---

After the condemning entity files a condemnation claim in court, the judge will appoint three local landowners to serve as special commissioners. The judge will give you a reasonable period to strike one of the special commissioners. If a commissioner is struck, the judge will appoint a replacement. These special commissioners must live in the county where the condemnation proceeding is filed, and they must take an oath to assess the amount of adequate compensation fairly, impartially, and according to the law. The special commissioners are not legally authorized to decide whether the condemnation is necessary or if the public use is proper. Their role is limited to assessing adequate compensation for you. After being appointed, the special commissioners must schedule a hearing at the earliest practical time and place. The special commissioners are also required to give you written notice of the condemnation hearing.

You are required to provide the condemning entity any appraisal reports that were used to determine your claim about adequate compensation for the condemned property. Under a new law enacted in 2011, landowners' appraisal reports must be provided to the condemning entity either ten days after the landowner receives the report or three business days before the special commissioners' hearing - whichever is earlier. You may hire an appraiser or real estate professional to help you determine the value of your private property. Additionally, you can hire an attorney to represent you during condemnation proceedings.

At the condemnation hearing, the special commissioners will consider your evidence on the value of your condemned property, the damages to remaining property, any value added to the remaining property as a result of the condemnation, and the condemning entity's proposed use of your condemned property.

## SPECIAL COMMISSIONERS' AWARD

After hearing evidence from all interested parties, the special commissioners will determine the amount of money that you should be awarded to adequately compensate you for your property. The special commissioners' decision is significant to you not only because it determines the amount that qualifies as adequate compensation, but also because it impacts who pays for the cost of the condemnation proceedings. Under the Texas Property Code, if the special commissioners' award is less than or equal to the amount the condemning entity offered to pay before the proceedings began, then you may be financially responsible for the cost of the condemnation proceedings. However, if the special commissioners' award is more than the condemning entity offered to pay before the proceedings began, then the condemning entity will be responsible for the costs associated with the proceedings.

The special commissioners are required to provide the court that appointed them a written decision. That decision is called the "Award." The Award must be filed with the court and the court must send written notice of the Award to all parties. After the Award is filed, the condemning entity may take possession of the property being condemned, even if either party appeals the Award of the special commissioners. To take possession of the property, the condemning entity must either pay the amount of the Award or deposit the amount of the Award into the court's registry. You have the right to withdraw funds that are deposited into the registry of the court.

## OBJECTION TO THE SPECIAL COMMISSIONERS' AWARD

If either the landowner or the condemning entity is dissatisfied with the amount of the Award, either party can formally object to the Award. In order to successfully make this valuation objection, it must be filed in writing with the court. If neither party timely objects to the special commissioners' Award, the court will adopt the Award as the final judgment of the court.

If a party timely objects to the special commissioners' Award, the court will hear the case in the same manner that other civil cases are heard. Landowners who object to the Award and ask the court to hear the matter have the right to a trial and can elect whether to have the case decided by a judge or jury. The allocation of any trial costs is decided in the same manner that costs are allocated with the special commissioners' Award. After trial, either party may appeal any judgment entered by the court.

## DISMISSAL OF THE CONDEMNATION ACTION

A condemning entity may file a motion to dismiss the condemnation proceeding if it decides it no longer needs your condemned property. If the court grants the motion to dismiss, the case is over and you are entitled to recover reasonable and necessary fees for attorneys, appraisers, photographers, and for other expenses incurred to the date of the hearing on the motion to dismiss.

If you wish to challenge the condemning entity's authority to take your property, you can lodge that challenge by filing a motion to dismiss the condemnation proceeding. Such a motion to dismiss would allege that the condemning entity did not have the right to condemn your property. For example, a landowner could challenge the condemning entity's claim that it seeks to take the property for a public use. If the court grants the landowner's motion, the court may award the landowner reasonable and necessary fees for attorneys, appraisers, photographers, and for other expenses incurred to the date of the hearing or judgment.

## RELOCATION COSTS

---

If you are displaced from your residence or place of business, you may be entitled to reimbursement for reasonable expenses incurred while moving personal property from the residence or relocating the business to a new site. However, during condemnation proceedings, reimbursement for relocation costs may not be available if those costs are separately recoverable under another law. Texas law limits the total amount of available relocation costs to the market value of the property being moved. Further, the law provides that moving costs are limited to the amount that a move would cost if it were within 50 miles.

## RECLAMATION OPTIONS

---

If private property was condemned by a governmental entity, and the public use for which the property was acquired is canceled before that property is used for that public purpose, no actual progress is made toward the public use within ten years or the property becomes unnecessary for public use within ten years, landowners may have the right to repurchase the property for the price paid to the owner by the entity at the time the entity acquired the property through eminent domain.

## DISCLAIMER

---

The information in this statement is intended to be a summary of the applicable portions of Texas state law as required by HB 1495, enacted by the 80th Texas Legislature, Regular Session. This statement is not legal advice and is not a substitute for legal counsel.

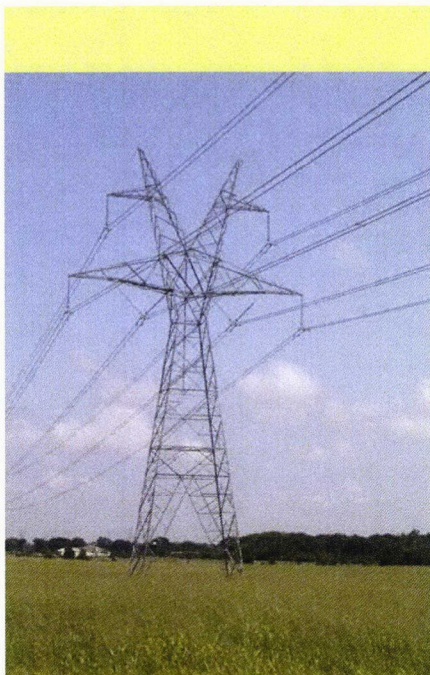
## ADDITIONAL RESOURCES

---

Further information regarding the procedures, timelines and requirements outlined in this document can be found in Chapter 21 of the Texas Property Code.



THIS PAGE LEFT BLANK INTENTIONALLY



**What is a transmission line?  
Why do Oncor & AEP Texas need  
to build them?**

Transmission lines are the high voltage conductors that move electricity from power plants to distribution systems, which deliver electricity to your homes and businesses. Ensuring adequate transmission capability is essential for electric reliability. It may help to think of them as "highways" for electricity. In the same way that highways are built to ensure that you and your family get from one place to another, transmission lines are necessary to make sure that electricity gets from where it is produced to where it is consumed.

*For More Information, contact:*

Chris Reilly  
Regulatory Project Manager  
Oncor Electric Delivery Company LLC  
[transmissionprojects@oncor.com](mailto:transmissionprojects@oncor.com)

Randy Roper  
Regulatory Case Manager  
AEP Texas Inc.  
[rroper@aep.com](mailto:rroper@aep.com)

Public Message Telephone:  
214-486-4717 (Oncor)  
512-481-4572 (AEP Texas)

Public website:  
[www.oncor.com/transmissionprojects/](http://www.oncor.com/transmissionprojects/)



## **Sand Lake – Solstice 345 kV Transmission Line Project**

As the state's economy continues to thrive, it is important to take steps to ensure that a reliable electric system is in place to support electric load growth. Oncor and AEP Texas continue to monitor electric demand in West Texas due to significant increases in oil and gas production, transportation, mid-stream processing, and other activities in the Permian Basin. In support of this continued load growth, Oncor and AEP Texas propose to construct a double-circuit 345 kV transmission line (project) approximately 44 to 80 miles long, depending on the route that is ultimately approved by the Public Utility Commission of Texas, located within Reeves, Ward, and Pecos Counties. This project has been endorsed by the Electric Reliability Council of Texas as critical to the reliability of the transmission system. The proposed project would connect Oncor's Sand Lake Switch, located approximately 6 miles northeast of the city of Pecos, to the existing AEP Texas Solstice Station, along Interstate Highway 10 within Pecos County, approximately 2.5 miles east of the Pecos / Reeves County line. Completion of this Oncor / AEP Texas project will achieve system upgrades that are necessary to serve existing customer's electrical needs and support future electric load growth in West Texas.

### **What is the process for approval?**

#### **Step 1: Need**

- The need for the project dictates essential facilities and generally prescribes their type, electrical location, and capacity.

#### **Step 2: Engineering, Routing and Environmental Assessment**

- The second step in the process of building a new transmission line is determining potential routes for the line. Oncor and AEP Texas, along with their outside consultants, consider a variety of environmental and other important factors in route development.
- Public Meeting(s) are held as a part of the route development process. The public is encouraged to attend these meeting(s) and learn more about the project, as well as provide input. Public input, along with detailed environmental analysis by the consultant and engineering and cost analysis by the utilities are important to the development of good routes.

#### **Step 3: Review/Approval Process**

- Oncor and AEP Texas will file an application, along with an environmental assessment, with the Public Utility Commission of Texas ("PUCT") requesting a Certificate of Convenience and Necessity ("CCN"), which outlines specific attributes of the line, describes the need for the line and identifies potential impacts on the surrounding community and environment.
- After Oncor and AEP Texas file the CCN application with the PUCT, interested parties have an opportunity to participate in the process and express their views to the PUCT. The ERCOT critical designation for the project establishes a six month period for the PUCT to approve or deny a CCN application. The requisite formal review and approval process for the proposed project is an involved process that thoroughly examines and considers essential interests of the public, which can take considerable involvement and time.

#### **Step 4: Post-Approval**

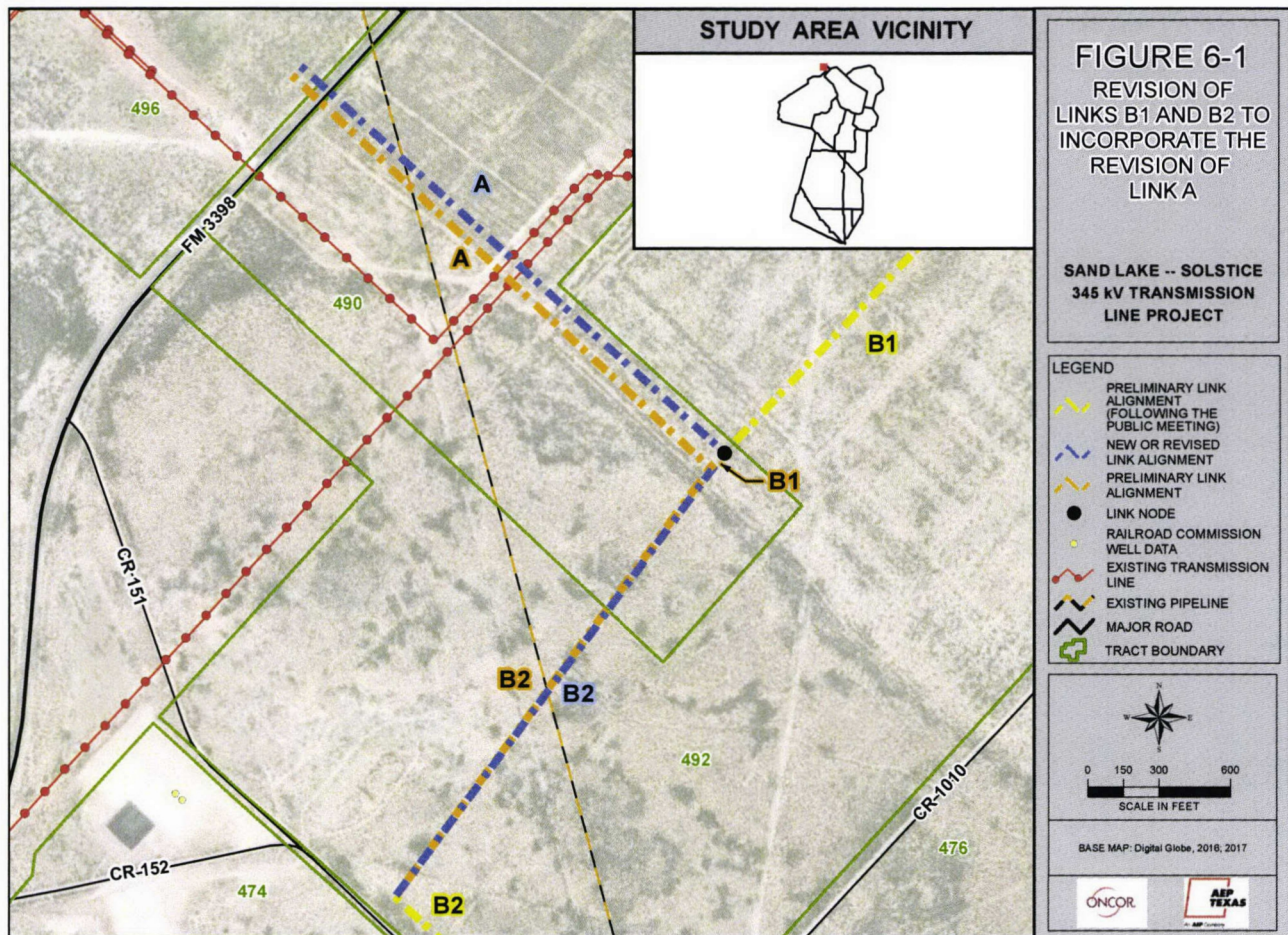
- After a CCN is approved by the PUCT, Oncor and AEP Texas will begin acquiring rights-of-way and constructing the new facilities.

THIS PAGE LEFT BLANK INTENTIONALLY

**Appendix C**  
**Preliminary Route Modifications**

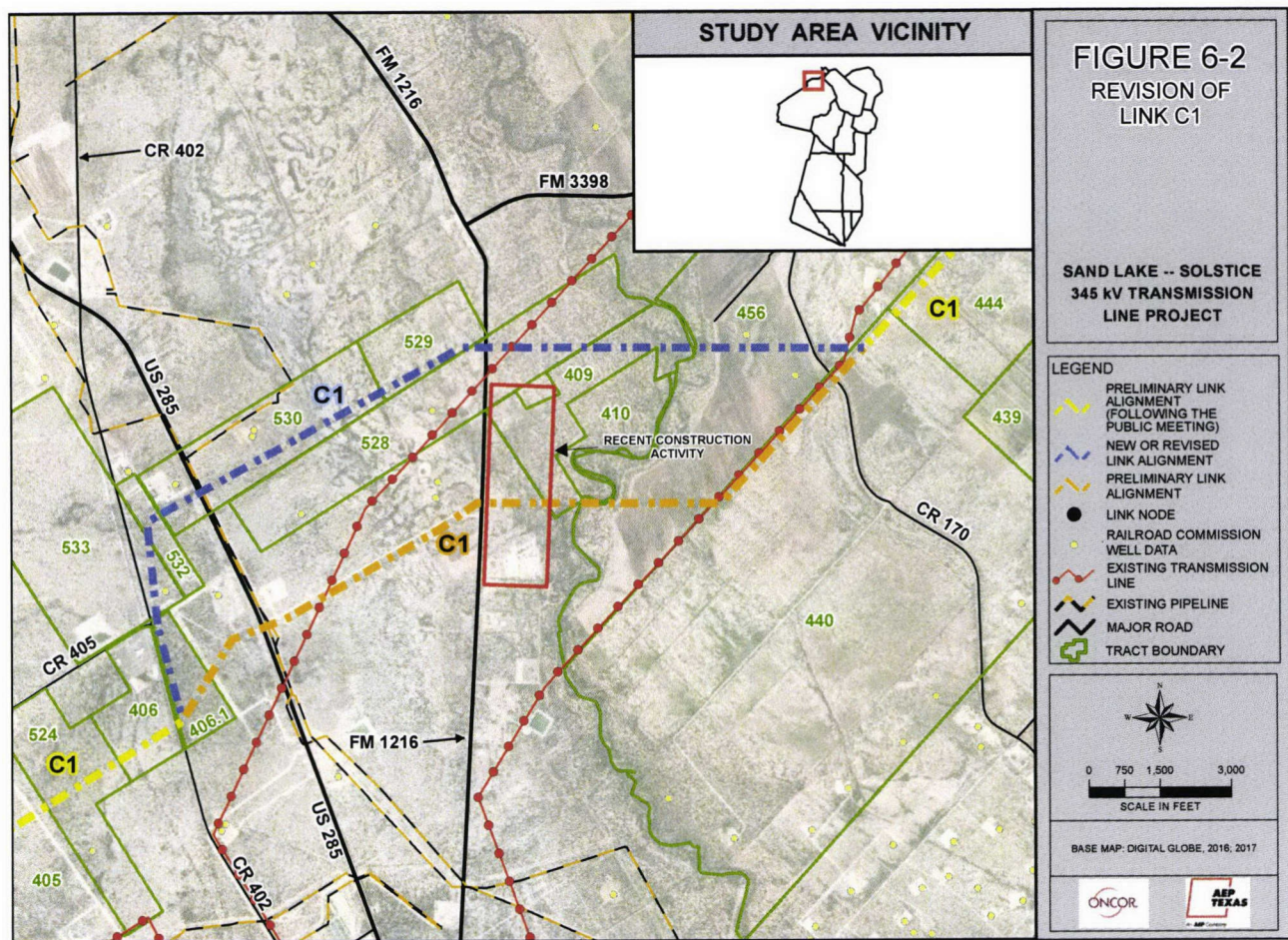
THIS PAGE LEFT BLANK INTENTIONALLY





THIS PAGE LEFT BLANK INTENTIONALLY





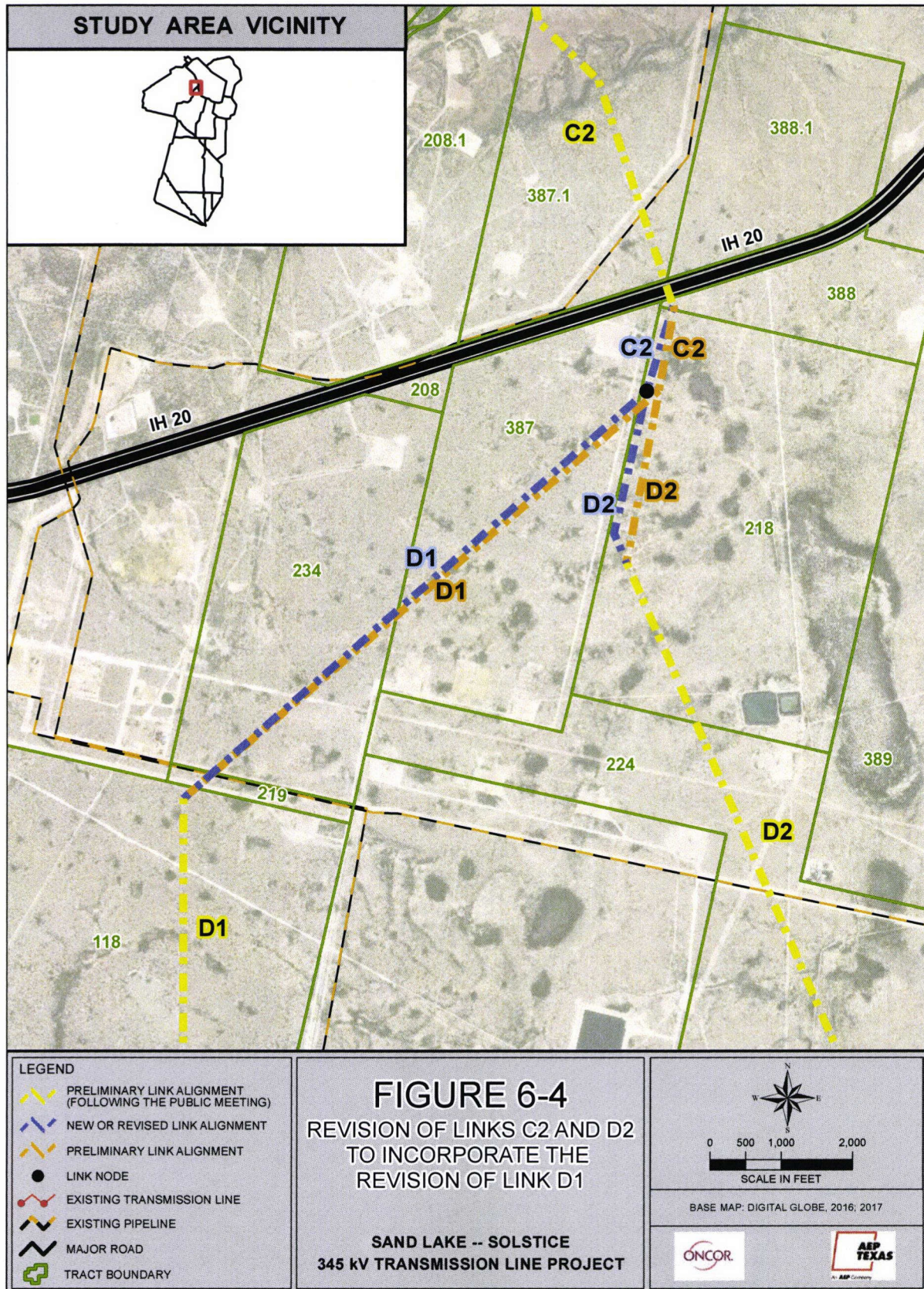


THIS PAGE LEFT BLANK INTENTIONALLY



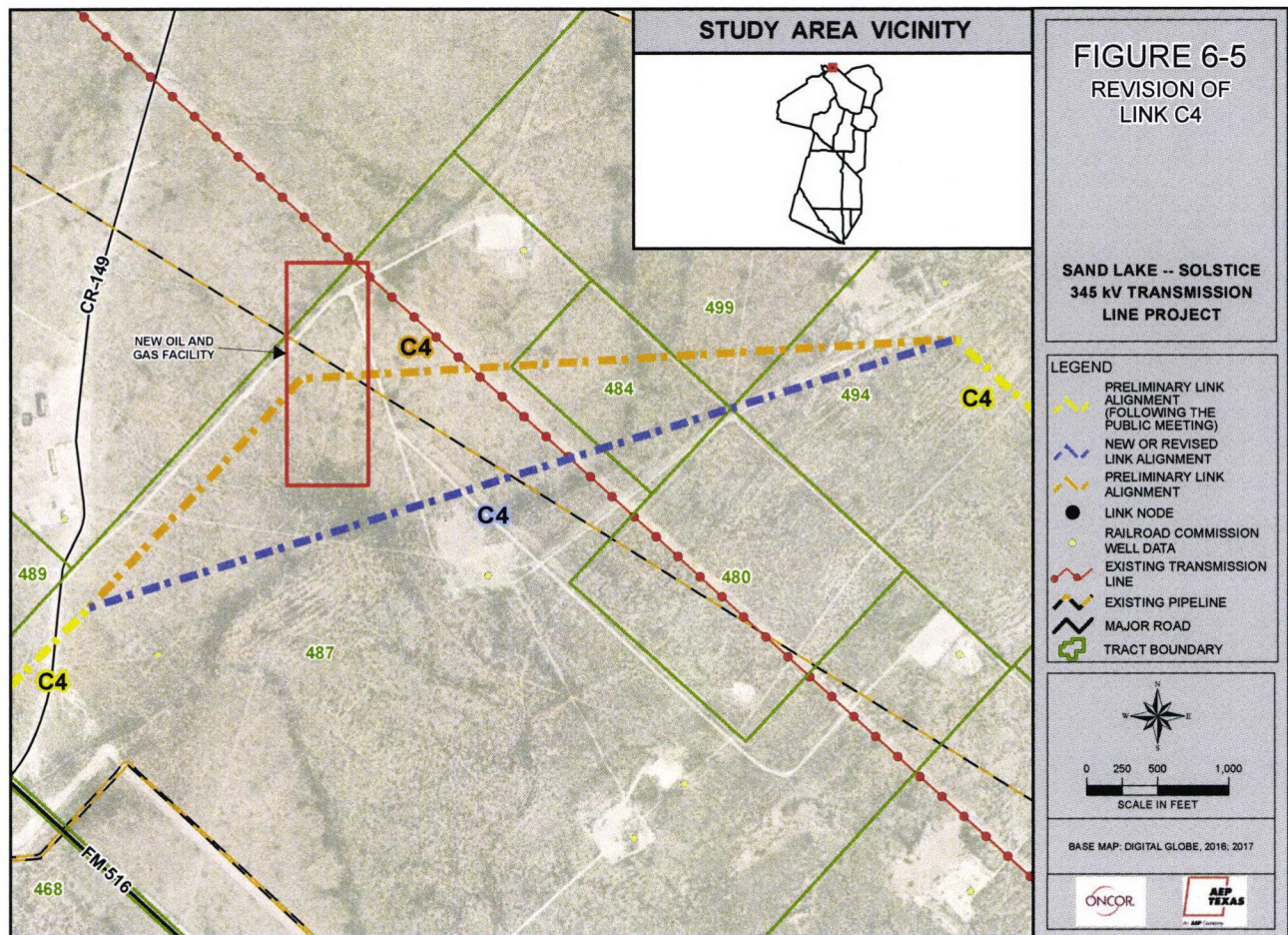
THIS PAGE LEFT BLANK INTENTIONALLY





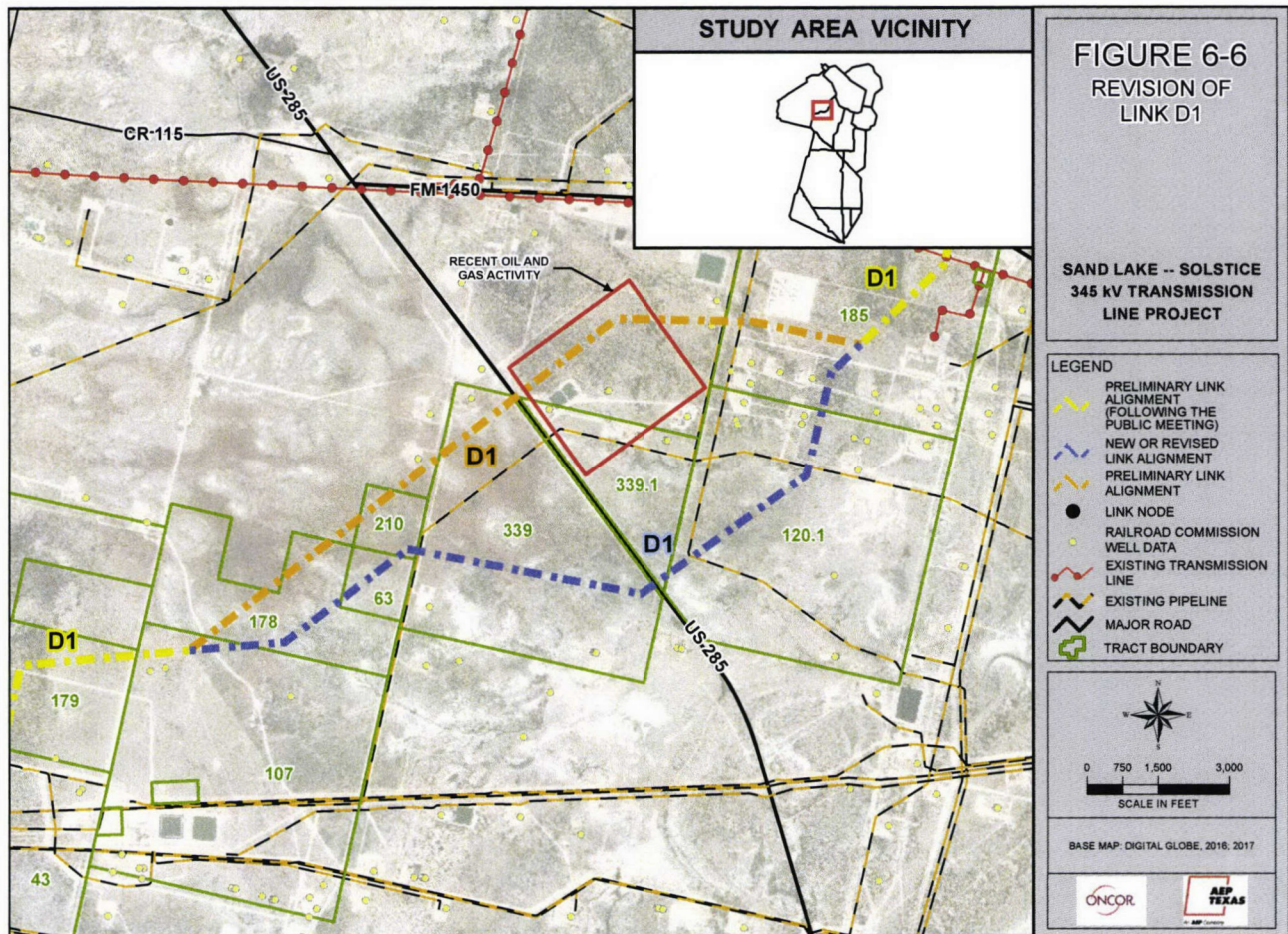
THIS PAGE LEFT BLANK INTENTIONALLY





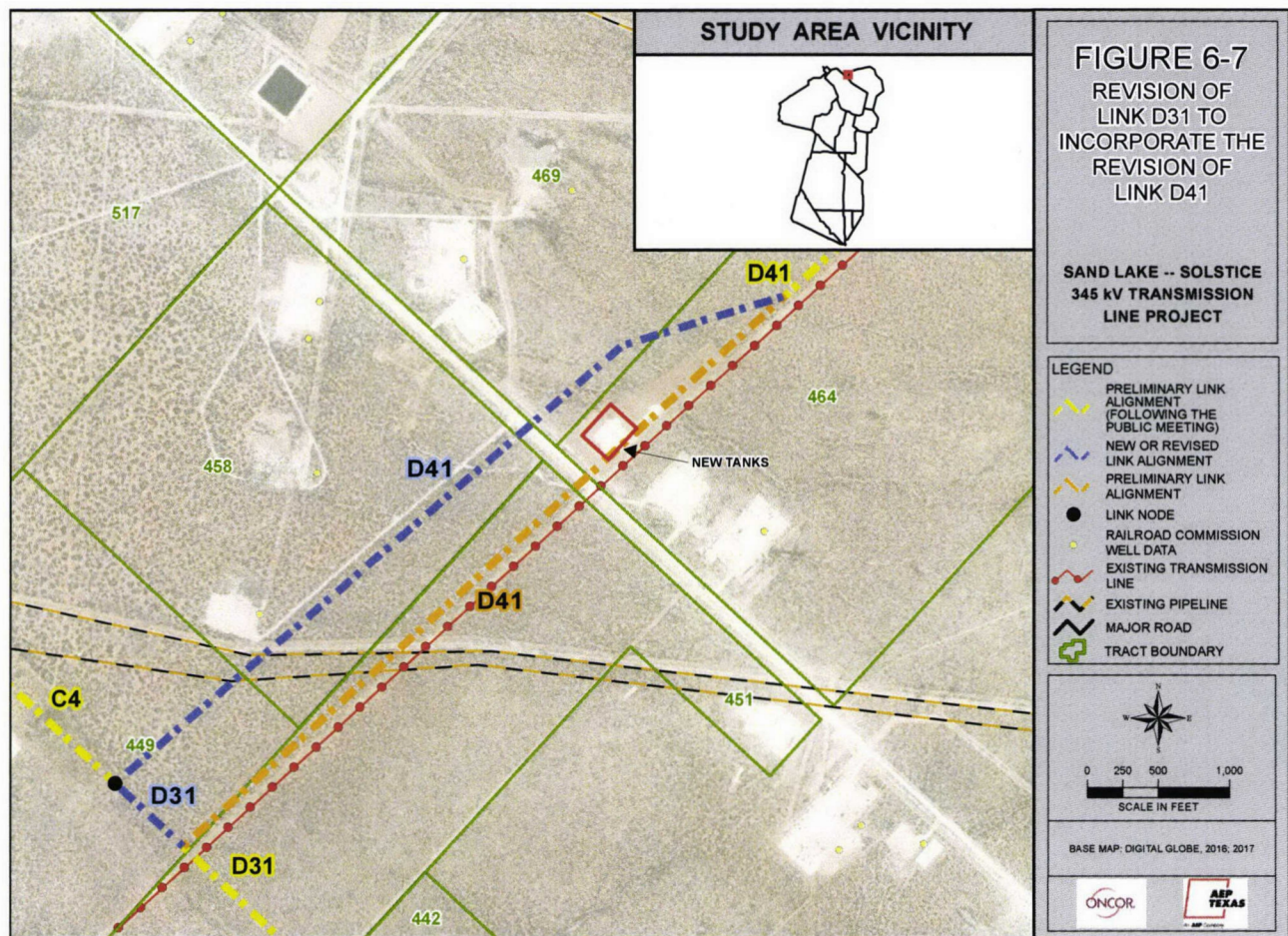
THIS PAGE LEFT BLANK INTENTIONALLY





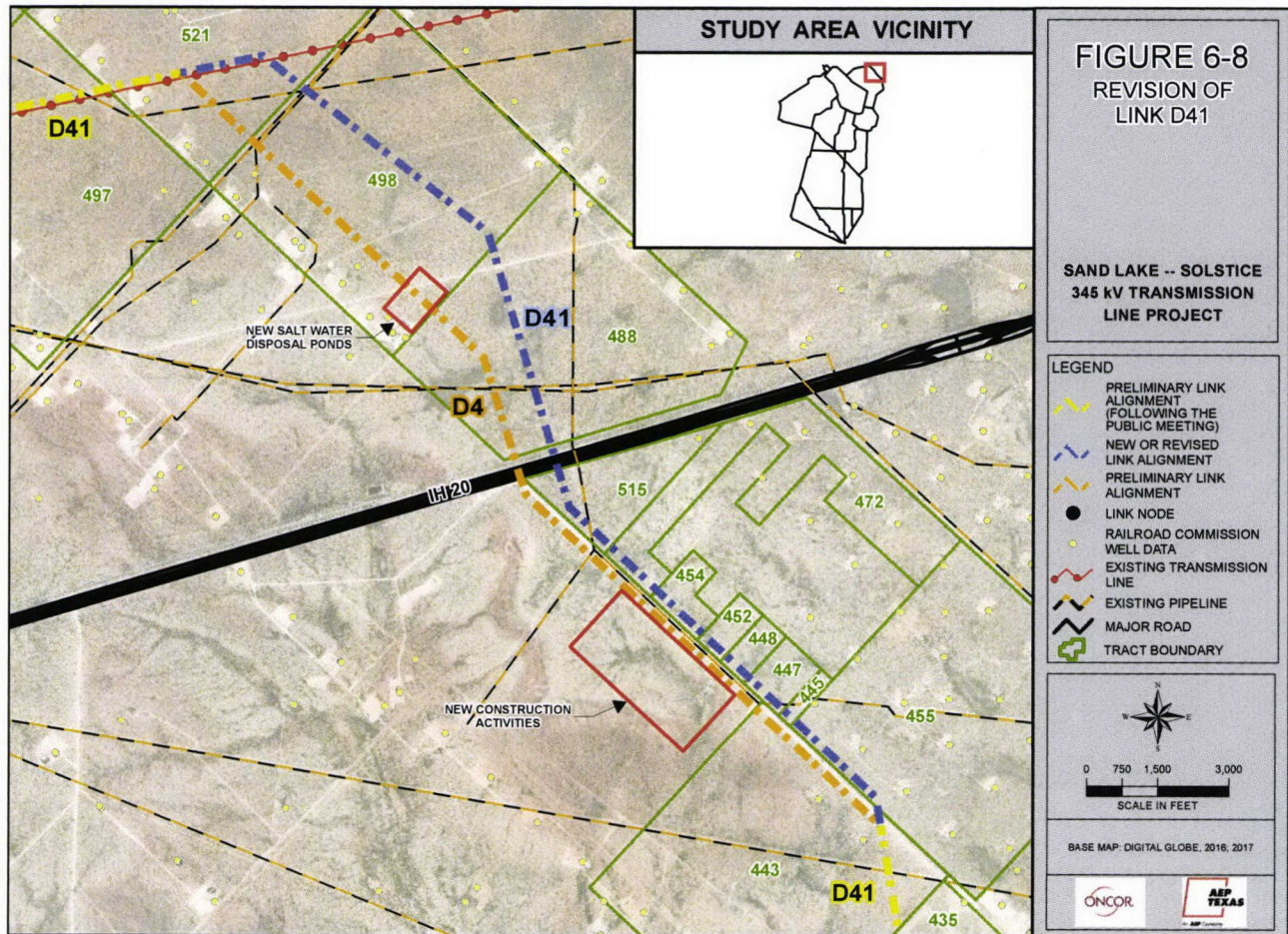


THIS PAGE LEFT BLANK INTENTIONALLY



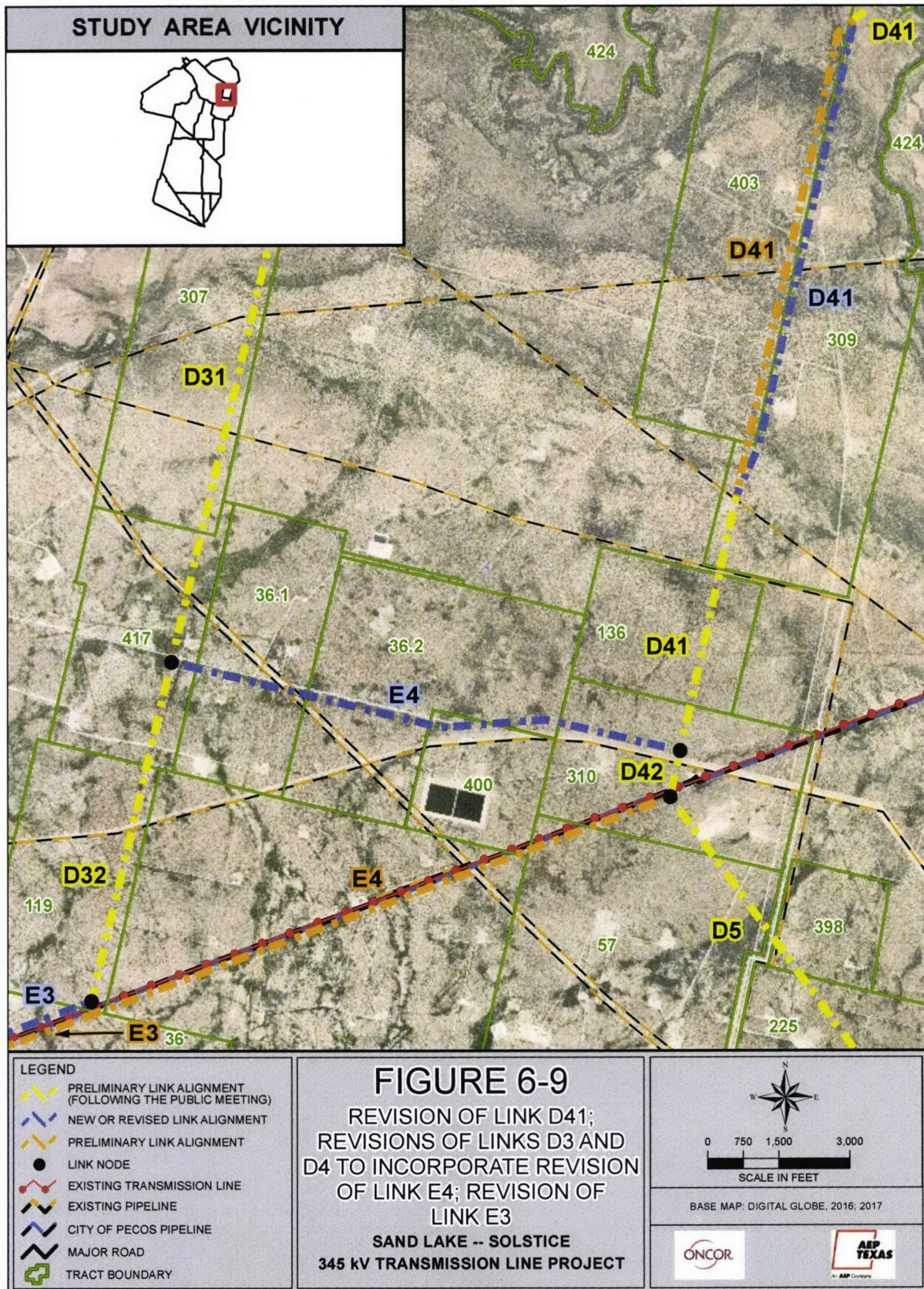
THIS PAGE LEFT BLANK INTENTIONALLY





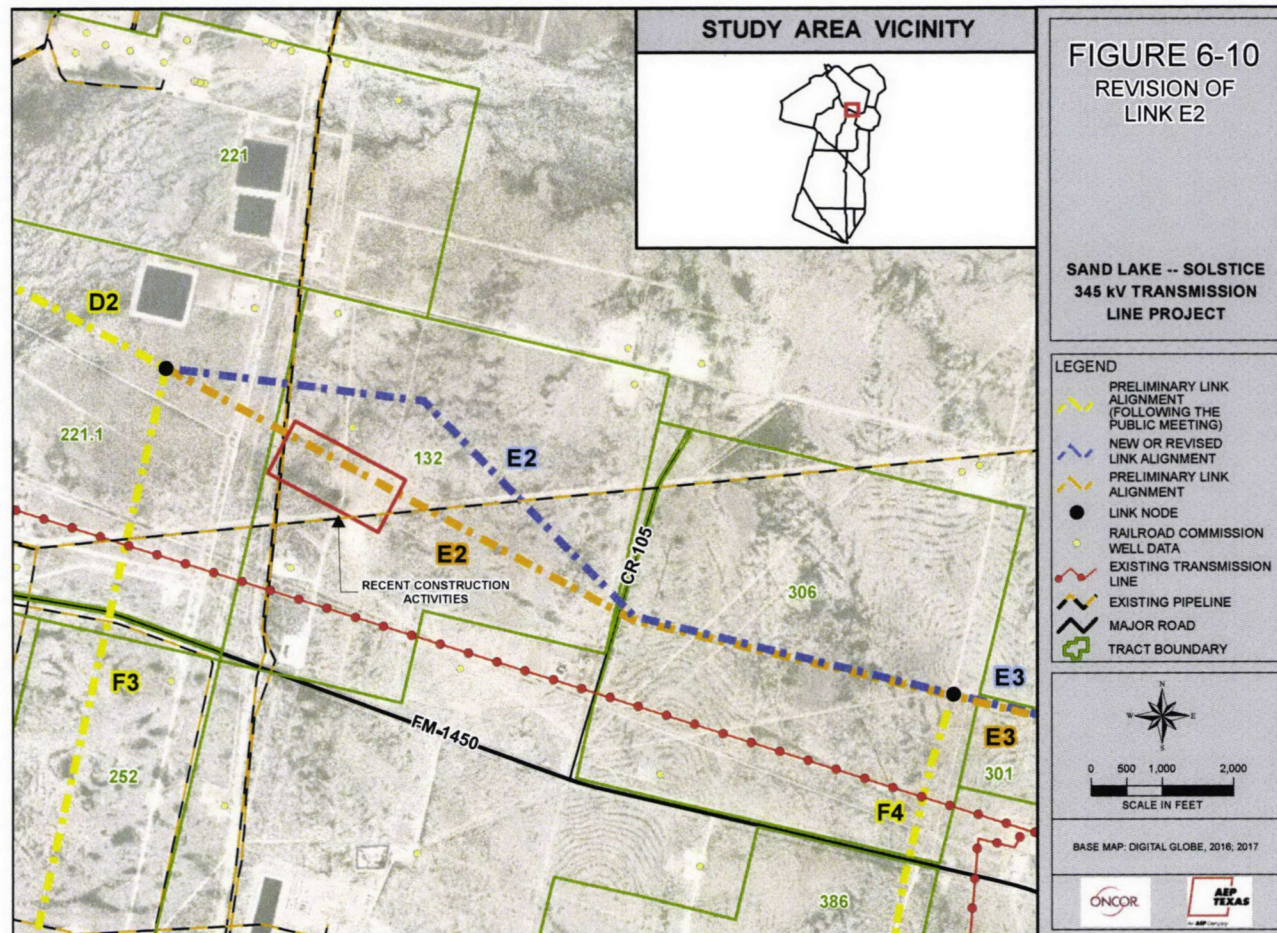
THIS PAGE LEFT BLANK INTENTIONALLY





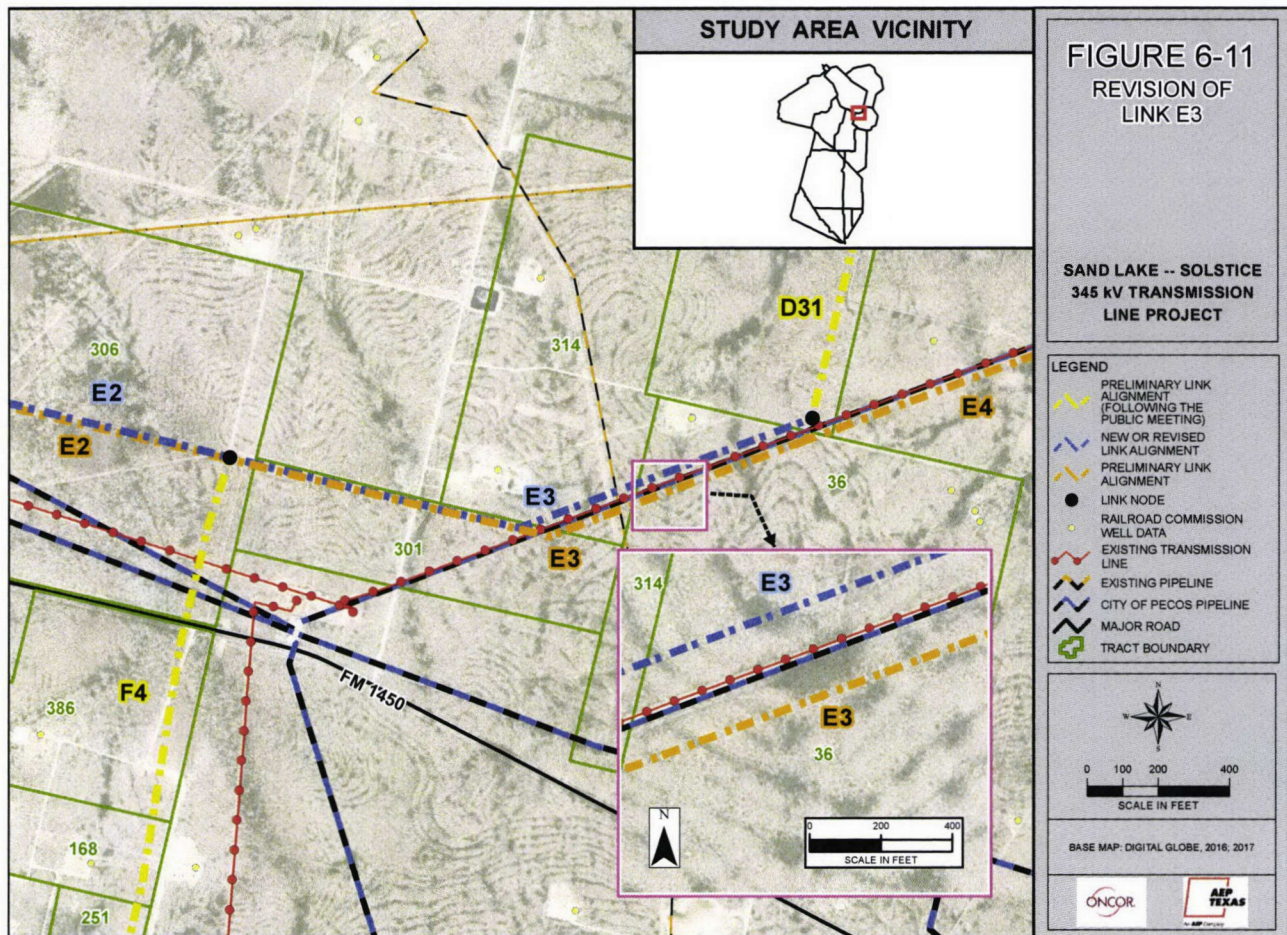
THIS PAGE LEFT BLANK INTENTIONALLY





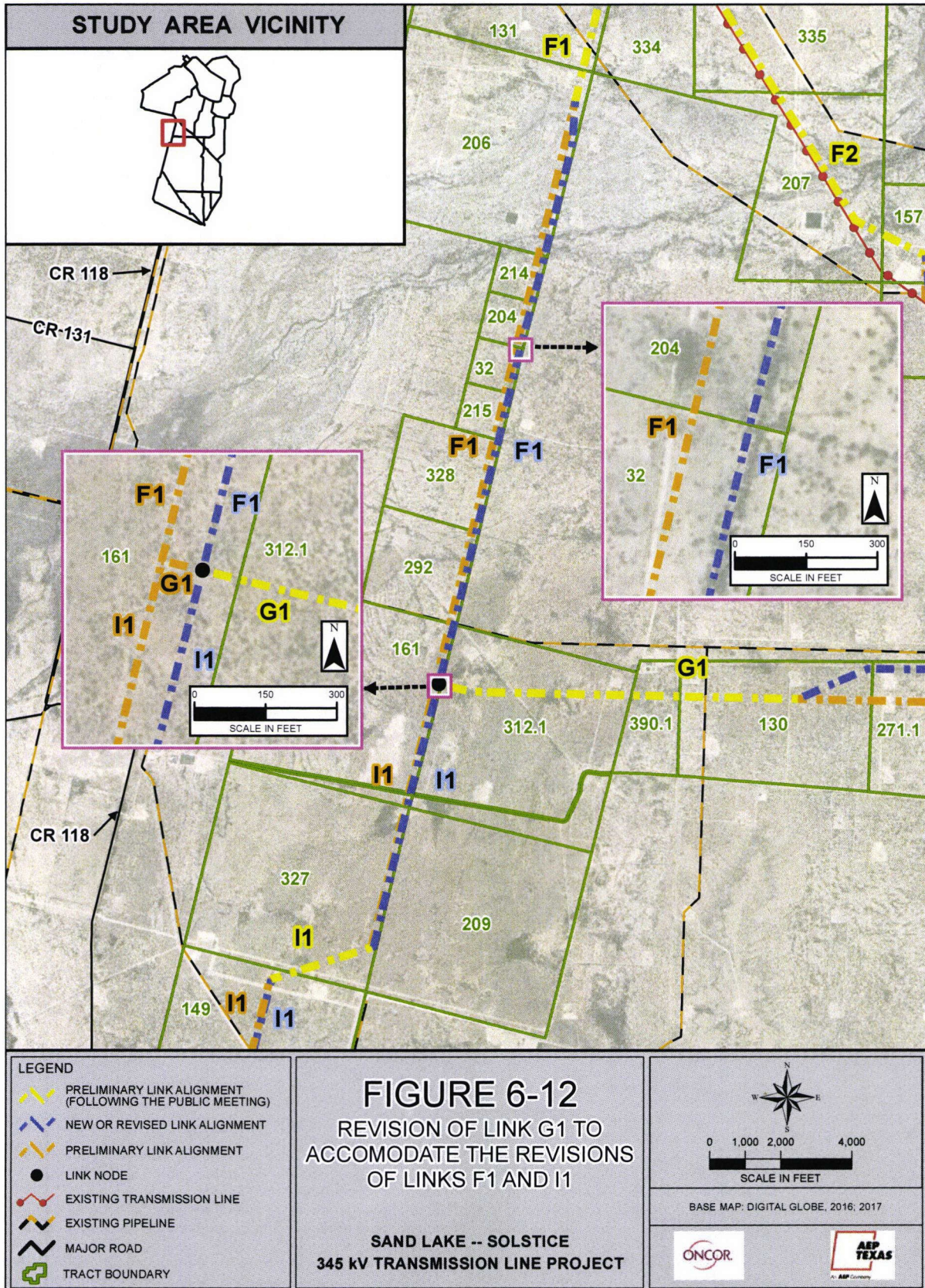


THIS PAGE LEFT BLANK INTENTIONALLY



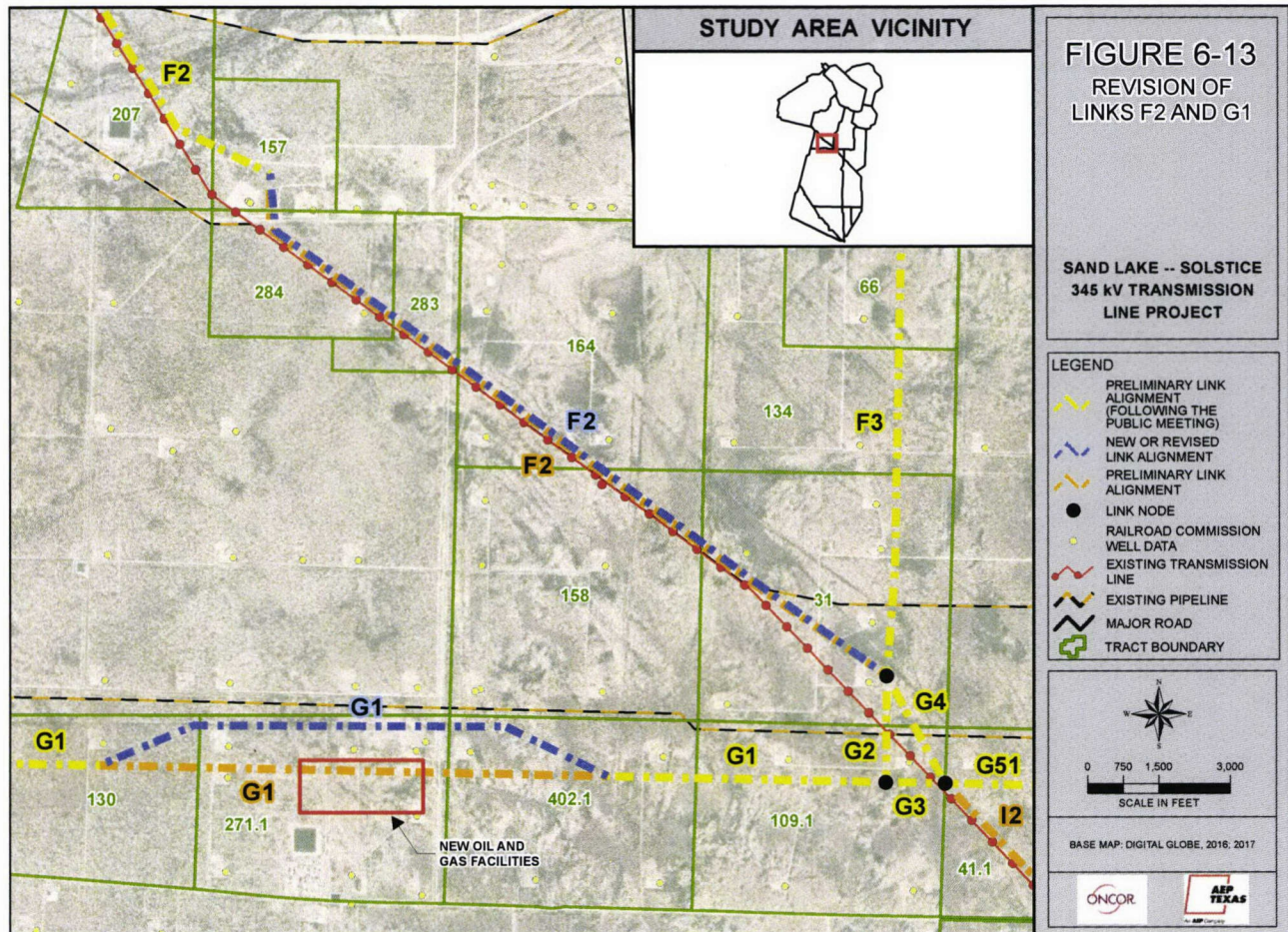
THIS PAGE LEFT BLANK INTENTIONALLY





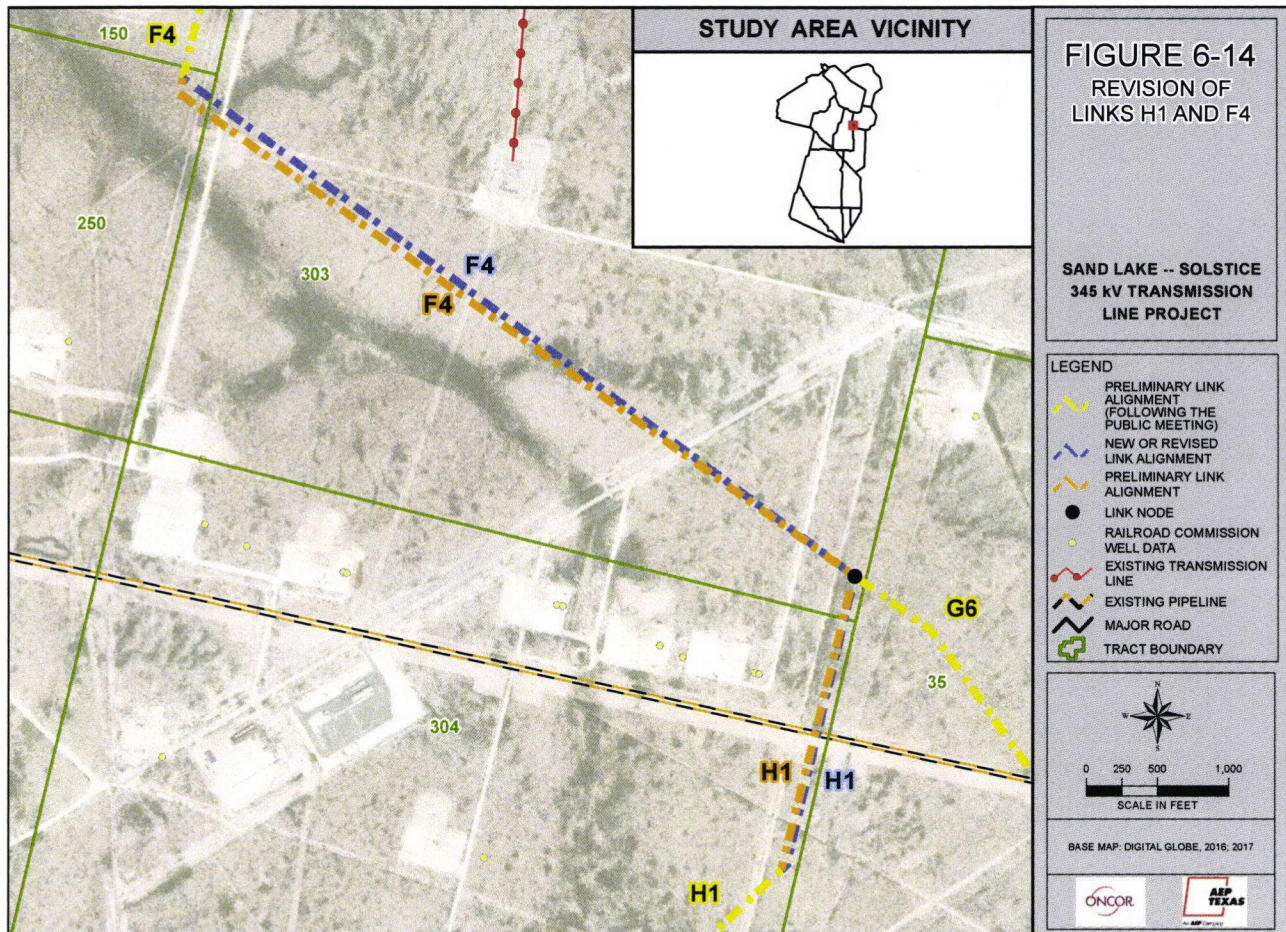
THIS PAGE LEFT BLANK INTENTIONALLY





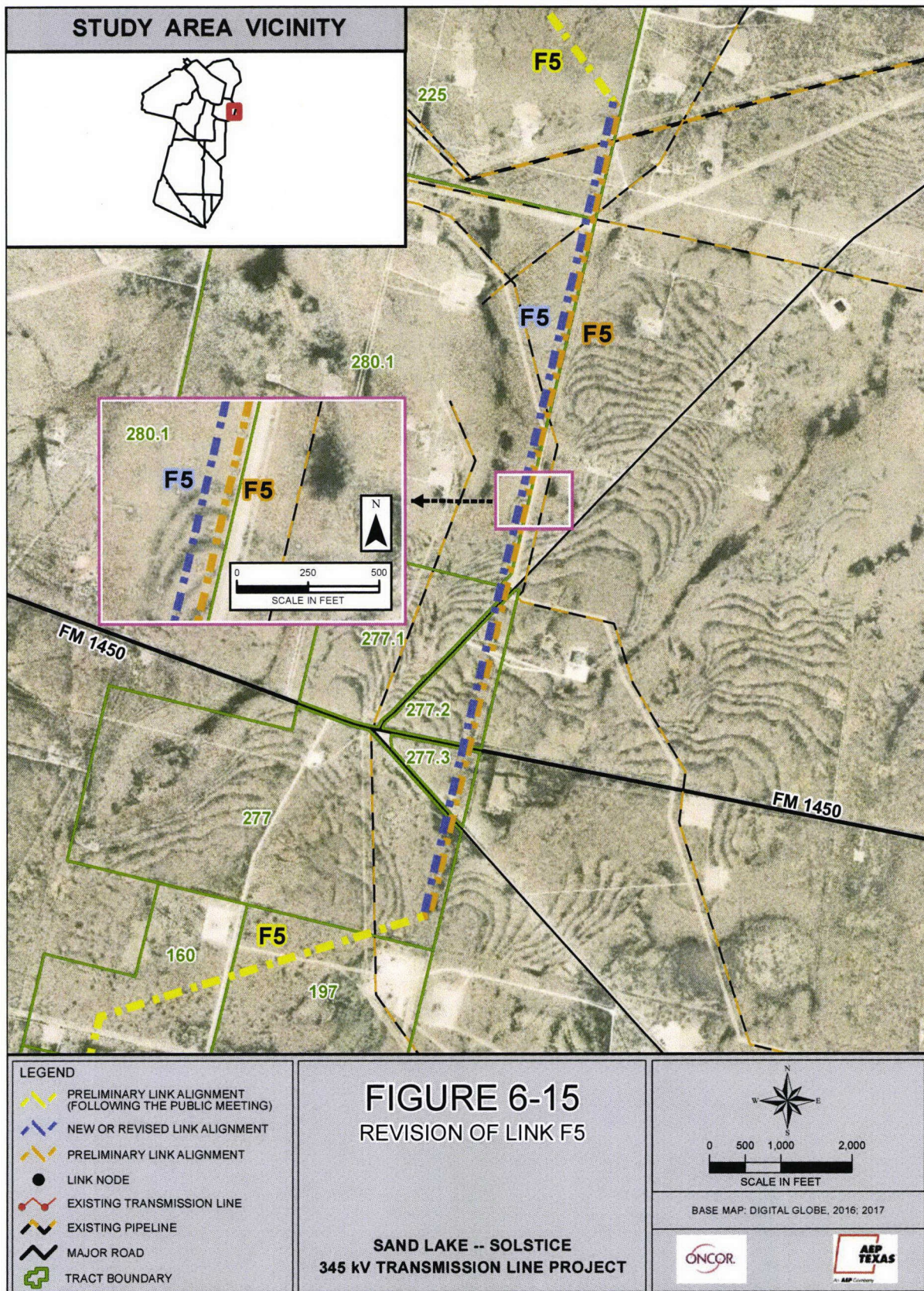


THIS PAGE LEFT BLANK INTENTIONALLY



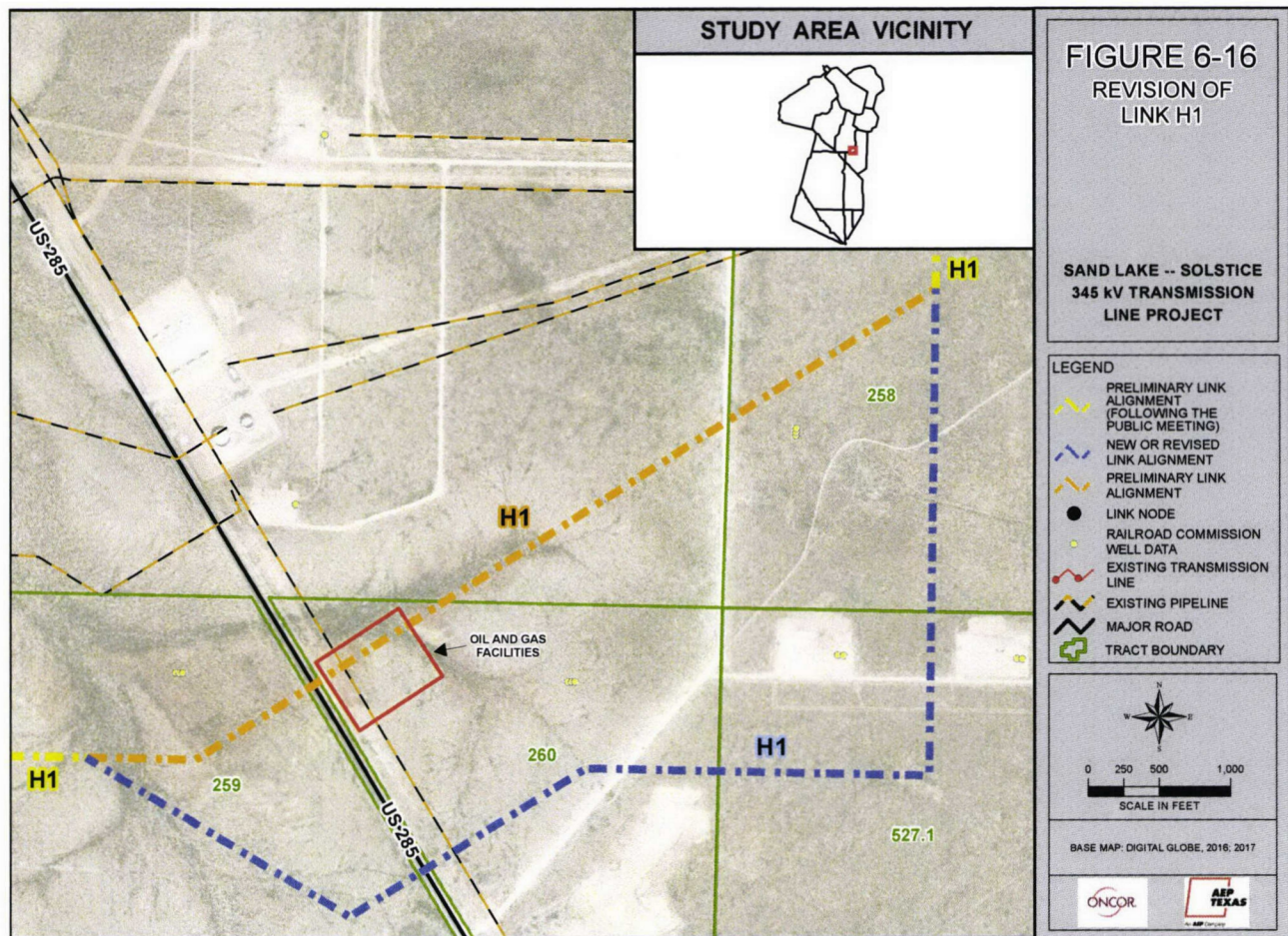
THIS PAGE LEFT BLANK INTENTIONALLY





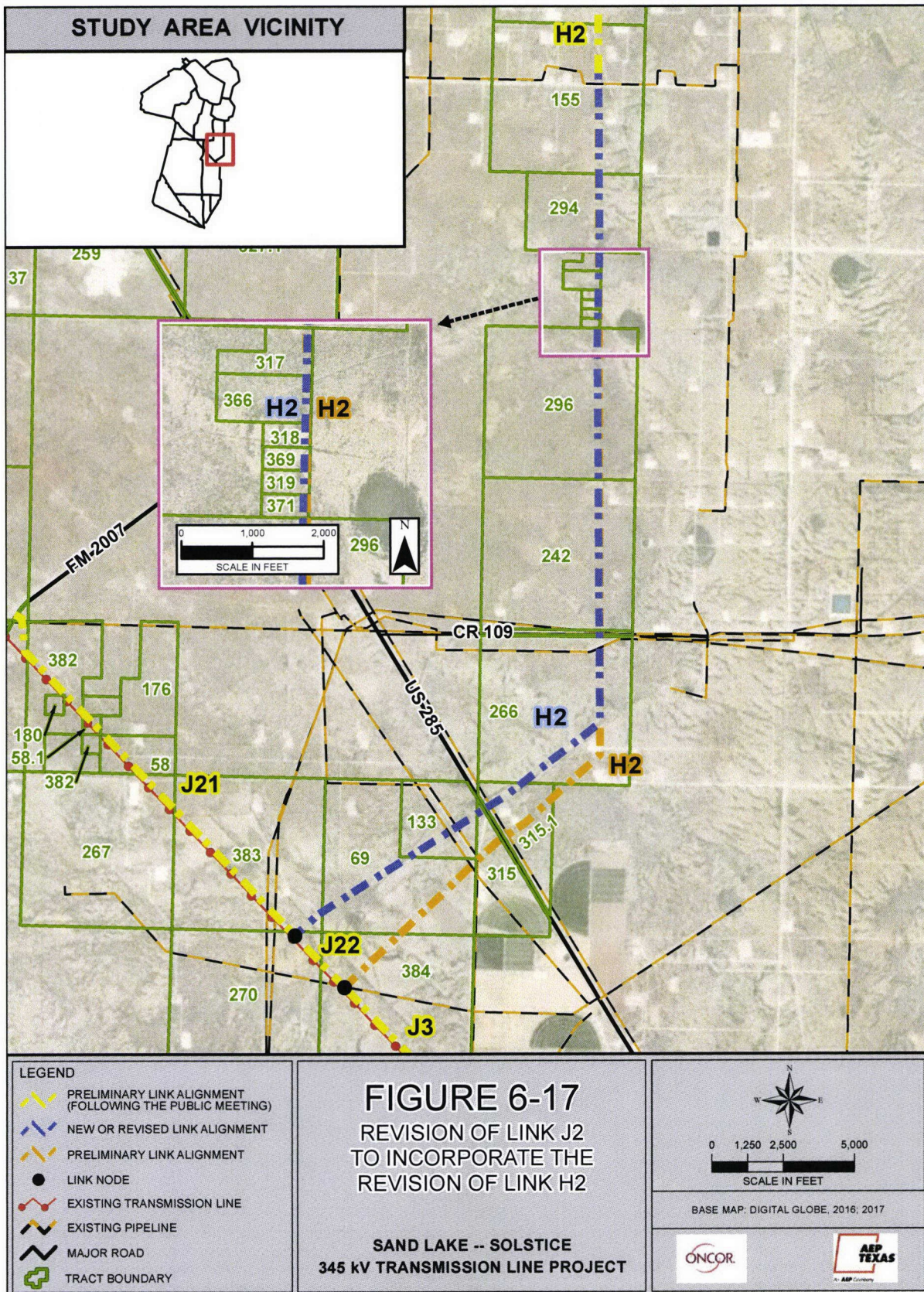


THIS PAGE LEFT BLANK INTENTIONALLY



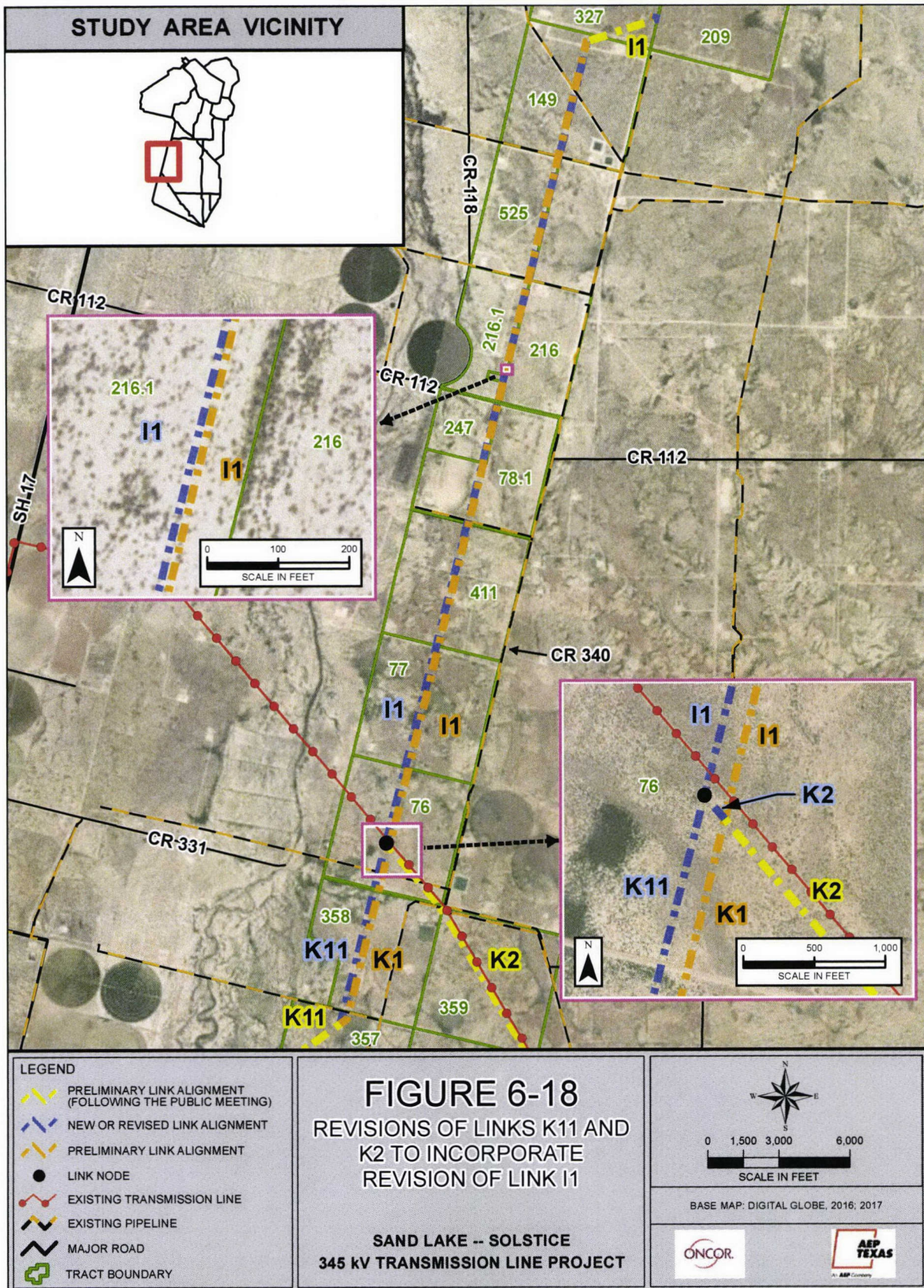


THIS PAGE LEFT BLANK INTENTIONALLY



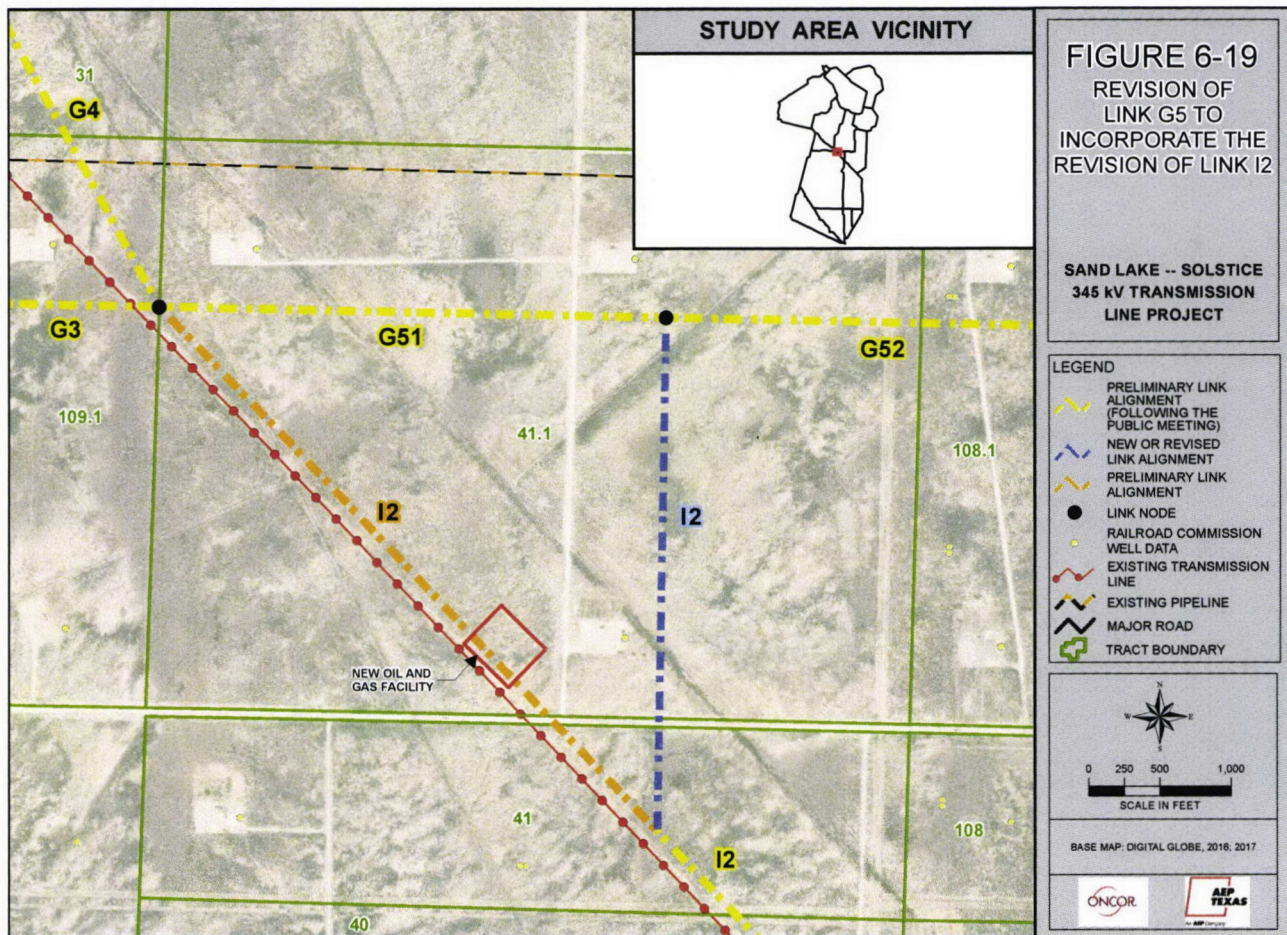
THIS PAGE LEFT BLANK INTENTIONALLY





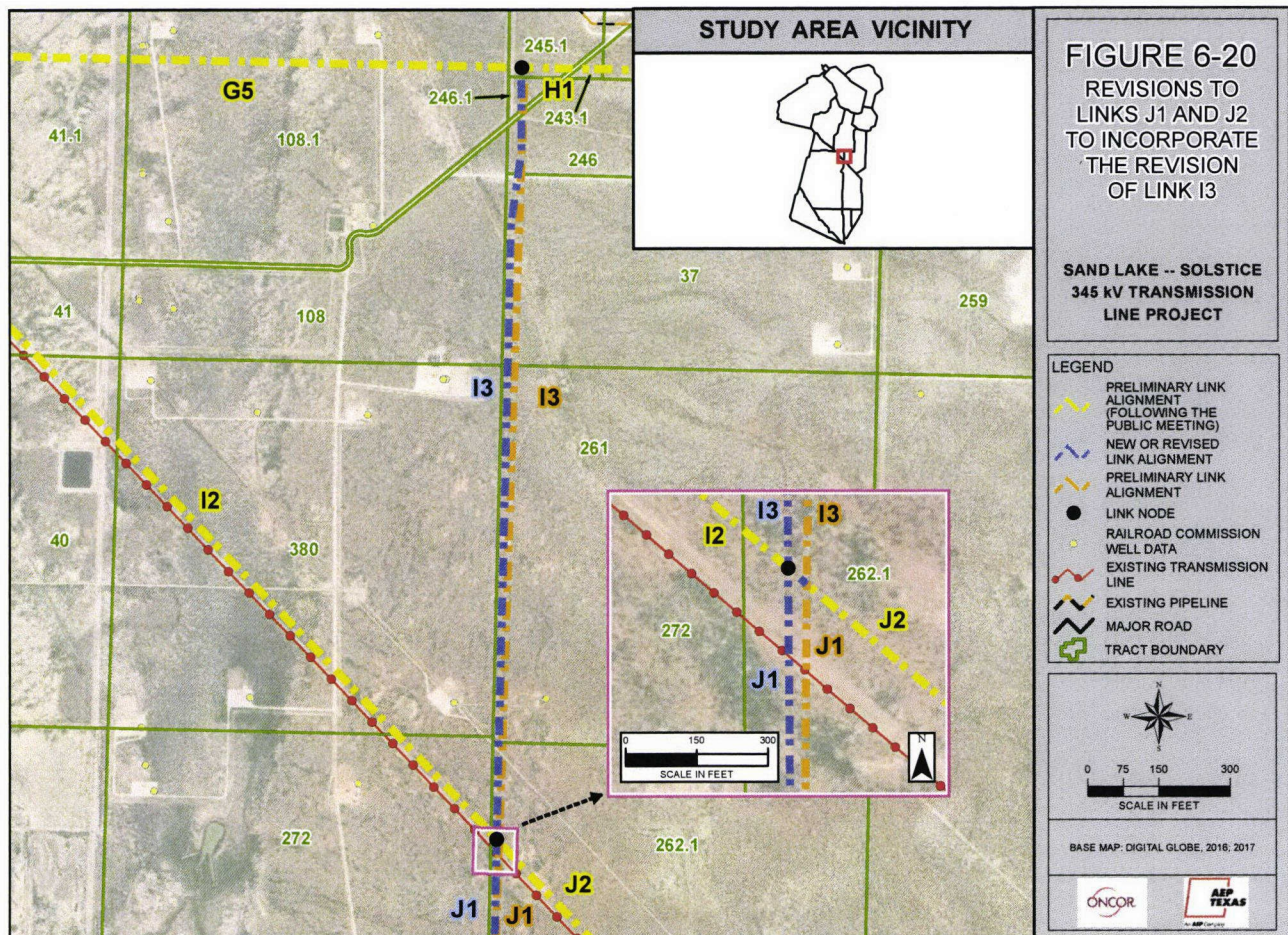


THIS PAGE LEFT BLANK INTENTIONALLY



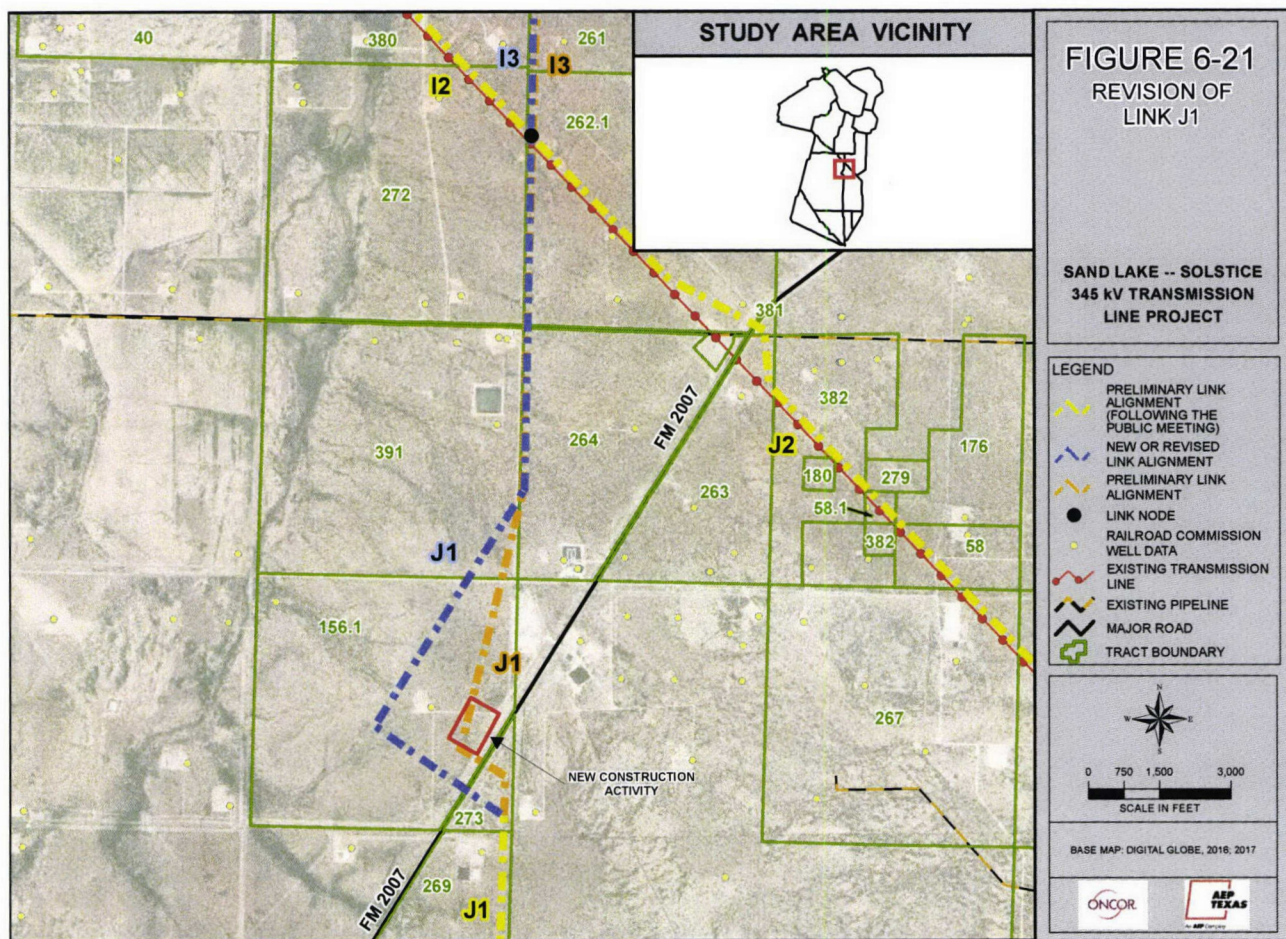
THIS PAGE LEFT BLANK INTENTIONALLY





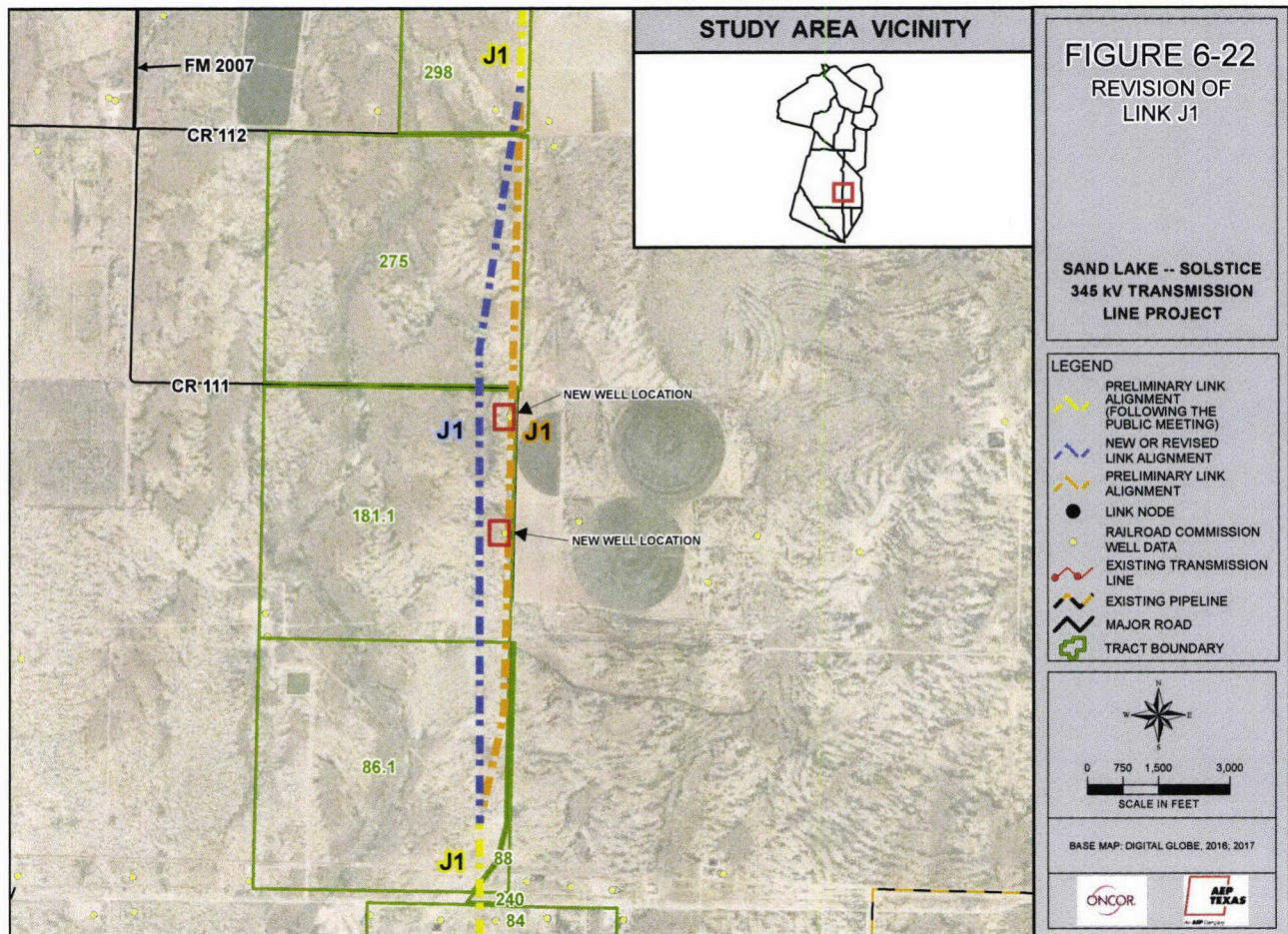


THIS PAGE LEFT BLANK INTENTIONALLY



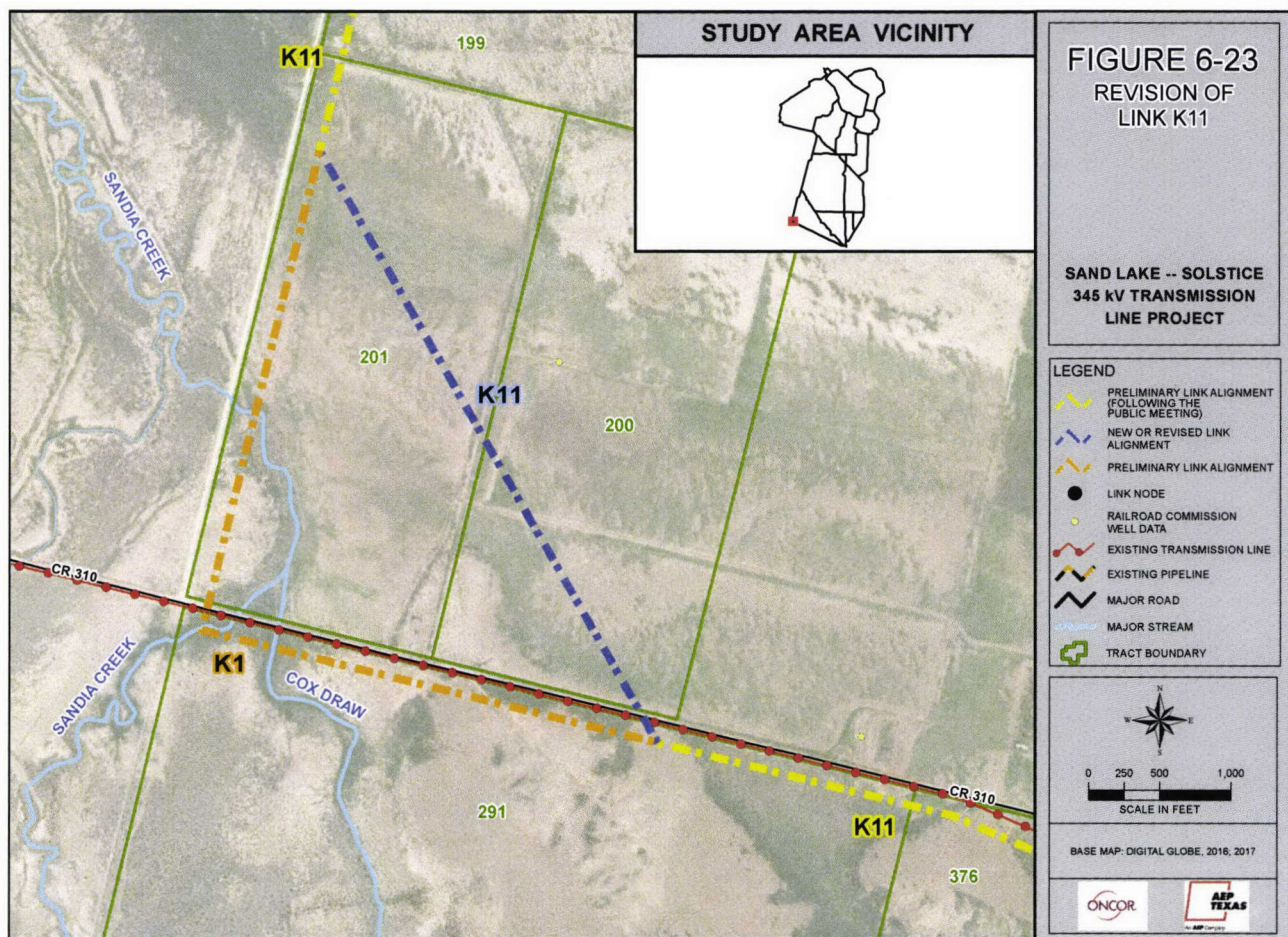
THIS PAGE LEFT BLANK INTENTIONALLY





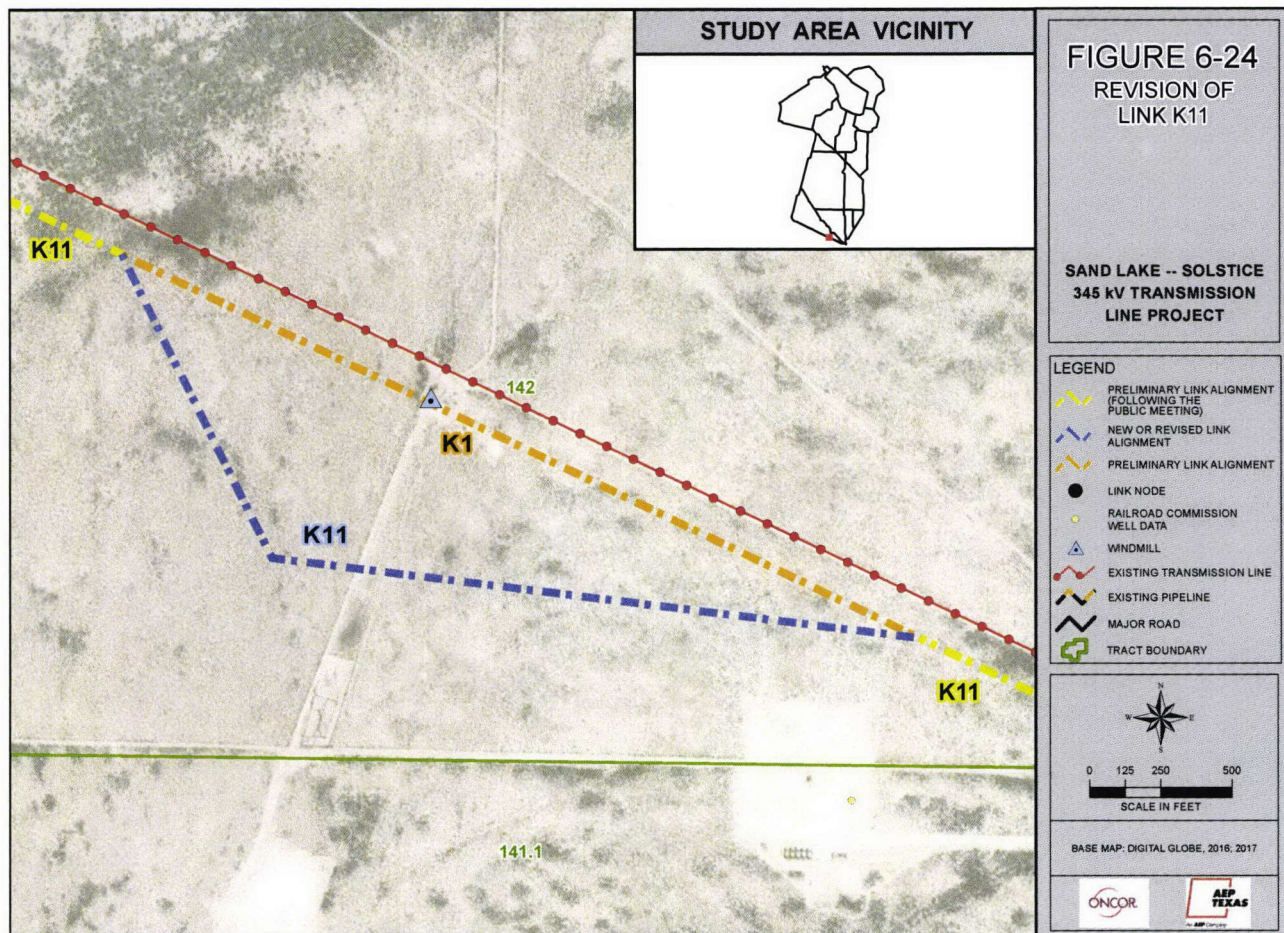
THIS PAGE LEFT BLANK INTENTIONALLY





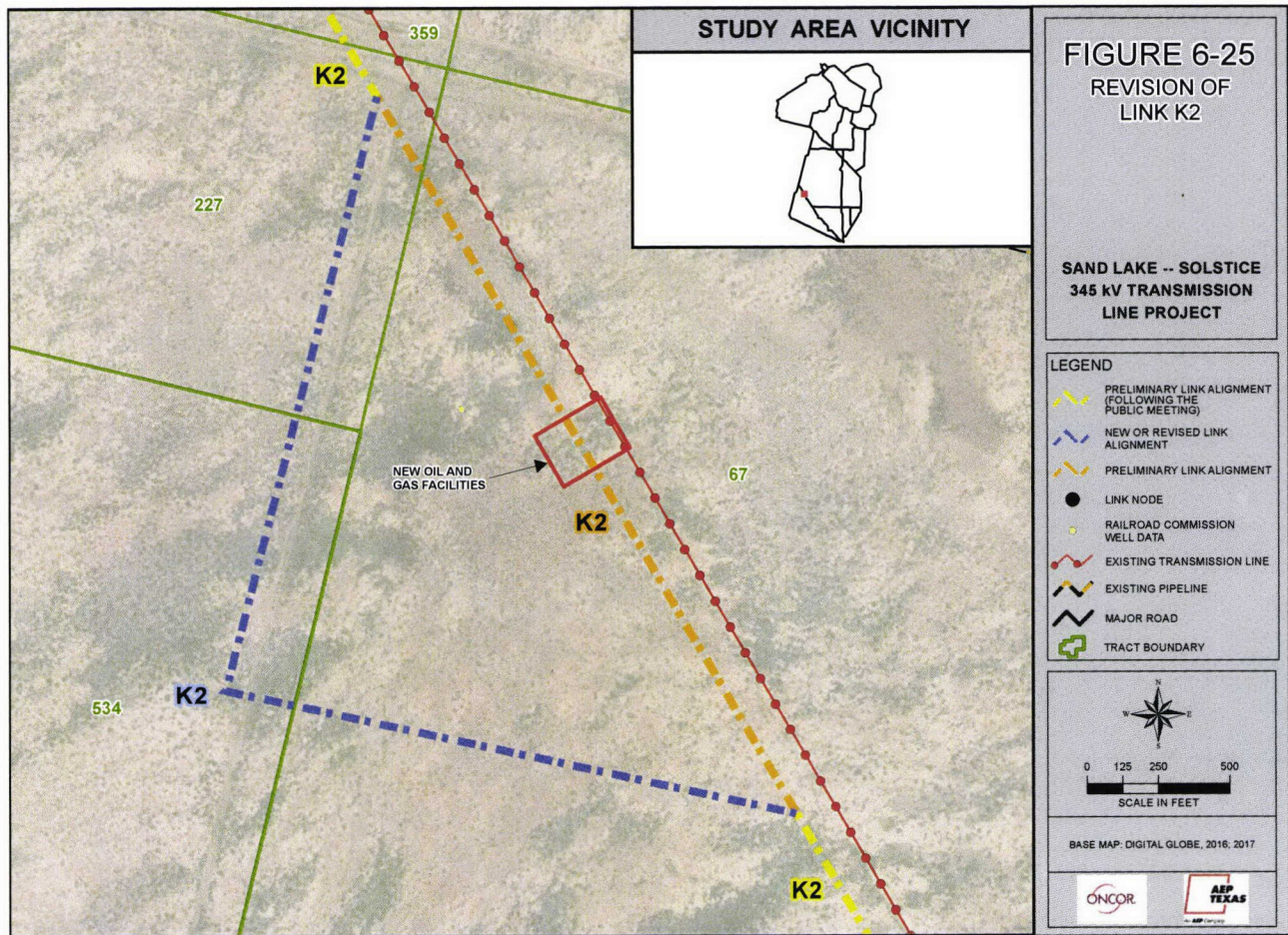


THIS PAGE LEFT BLANK INTENTIONALLY



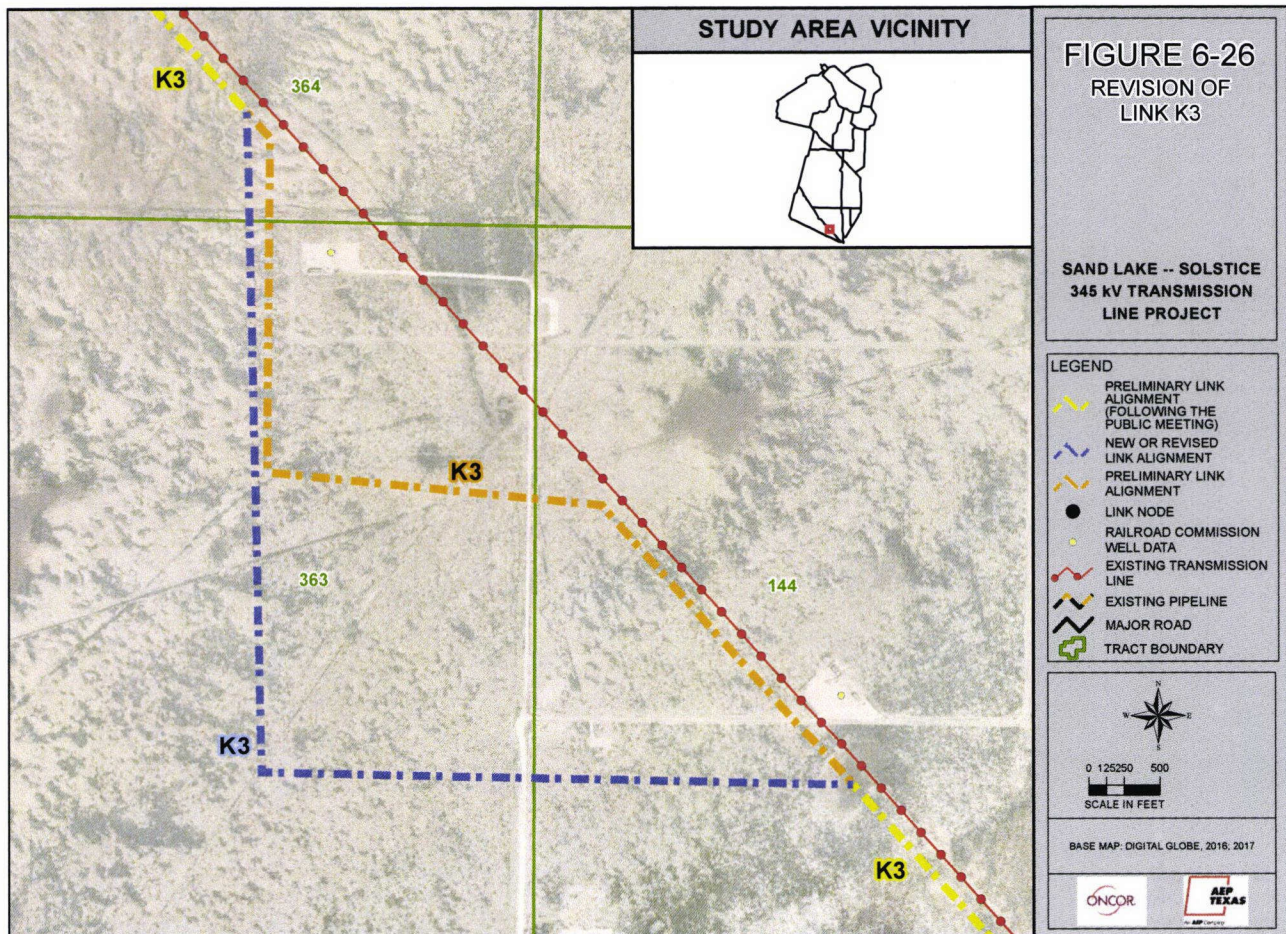
THIS PAGE LEFT BLANK INTENTIONALLY





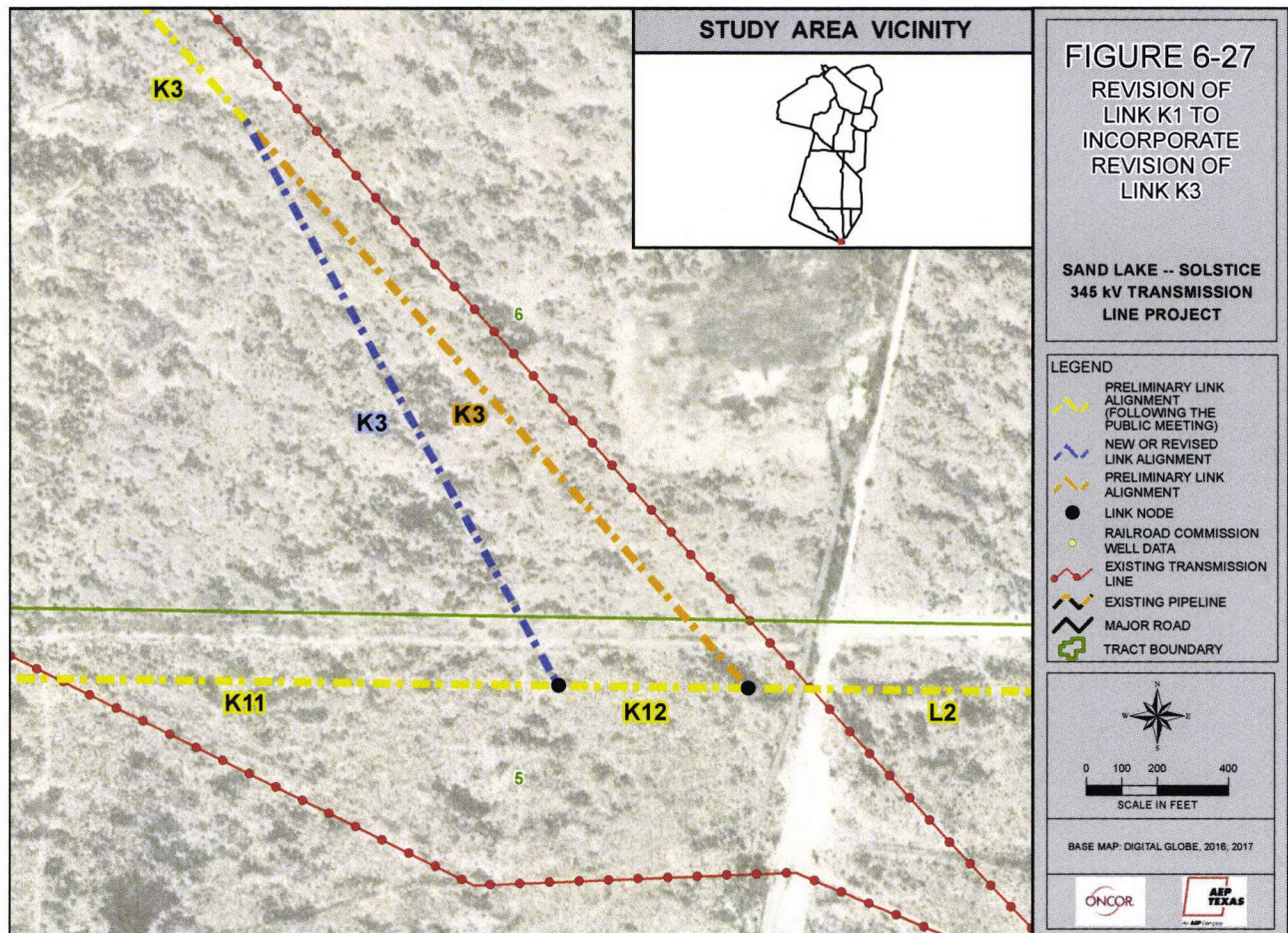
THIS PAGE LEFT BLANK INTENTIONALLY







THIS PAGE LEFT BLANK INTENTIONALLY



THIS PAGE LEFT BLANK INTENTIONALLY



**Appendix D**  
**Link Composition of Alternative Routes**

THIS PAGE LEFT BLANK INTENTIONALLY

**TABLE 7-1. LINK COMPOSITION OF ALTERNATIVE ROUTES.**

<b>Route</b>	<b>Link Sequence</b>	<b>Miles</b>
1	A-B1-C3-C2-D2-E2-F4-G6-H2-J22-J3-J4-J8-K5-L1-Z	51.8
2	A-B1-C3-C2-D2-E2-F4-G6-H2-J22-J3-J4-J5-J7-L1-Z	52.9
3	A-B1-C3-C2-D2-E2-F4-G6-H2-J22-J3-K4-K5-L1-Z	50.0
4	A-B1-C3-C2-D2-E2-F4-H1-G52-I2-J1-J7-L1-Z	50.3
5	A-B1-C3-C2-D2-E2-F4-H1-G52-I2-J1-J5-J8-K5-L1-Z	53.1
6	A-B1-C3-C2-D2-E2-F4-H1-G52-I2-J21-J22-J3-J4-J8-K5-L1-Z	54.8
7	A-B1-C3-C2-D2-E2-F4-H1-G52-I2-J21-J22-J3-J4-J5-J7-L1-Z	55.9
8	A-B1-C3-C2-D2-E2-F4-H1-G52-I2-J21-J22-J3-K4-K5-L1-Z	53.0
9	A-B1-C3-C2-D2-E2-F4-H1-G52-G51-G3-G1-I1-K11-K12-L2-Z	64.1
10	A-B1-C3-C2-D2-E2-F4-H1-G52-G51-G3-G1-I1-K2-J6-J7-L1-Z	63.7
11	A-B1-C3-C2-D2-E2-F4-H1-G52-G51-G3-G1-I1-K2-J6-J5-J8-K5-L1-Z	66.5
12	A-B1-C3-C2-D2-E2-F4-H1-G52-G51-G3-G1-I1-K2-K3-K12-L2-Z	60.8
13	A-B1-C3-C2-D2-E2-F4-H1-I3-J1-J7-L1-Z	48.4
14	A-B1-C3-C2-D2-E2-F4-H1-I3-J1-J5-J8-K5-L1-Z	51.2
15	A-B1-C3-C2-D2-E2-F4-H1-I3-J21-J22-J3-J4-J8-K5-L1-Z	52.9
16	A-B1-C3-C2-D2-E2-F4-H1-I3-J21-J22-J3-J4-J5-J7-L1-Z	54.0
17	A-B1-C3-C2-D2-E2-F4-H1-I3-J21-J22-J3-K4-K5-L1-Z	51.1
18	A-B1-C3-C2-D2-F3-G2-G3-G51-G52-I3-J1-J7-L1-Z	46.7
19	A-B1-C3-C2-D2-F3-G2-G3-G51-G52-I3-J1-J5-J8-K5-L1-Z	49.5
20	A-B1-C3-C2-D2-F3-G2-G3-G51-G52-I3-J21-J22-J3-J4-J8-K5-L1-Z	51.2
21	A-B1-C3-C2-D2-F3-G2-G3-G51-G52-I3-J21-J22-J3-J4-J5-J7-L1-Z	52.3
22	A-B1-C3-C2-D2-F3-G2-G3-G51-G52-I3-J21-J22-J3-K4-K5-L1-Z	49.4
23	A-B1-C3-C2-D2-F3-G2-G3-G51-I2-J1-J7-L1-Z	45.9
24	A-B1-C3-C2-D2-F3-G2-G3-G51-I2-J1-J5-J8-K5-L1-Z	48.7
25	A-B1-C3-C2-D2-F3-G2-G3-G51-I2-J21-J22-J3-J4-J8-K5-L1-Z	50.4
26	A-B1-C3-C2-D2-F3-G2-G3-G51-I2-J21-J22-J3-J4-J5-J7-L1-Z	51.5
27	A-B1-C3-C2-D2-F3-G2-G3-G51-I2-J21-J22-J3-K4-K5-L1-Z	48.6
28	A-B1-C3-C2-D2-F3-G2-G1-I1-K11-K12-L2-Z	57.9
29	A-B1-C3-C2-D2-F3-G2-G1-I1-K2-J6-J7-L1-Z	57.5
30	A-B1-C3-C2-D2-F3-G2-G1-I1-K2-J6-J5-J8-K5-L1-Z	60.3
31	A-B1-C3-C2-D2-F3-G2-G1-I1-K2-K3-K12-L2-Z	54.5
32	A-B1-C3-C2-D2-F3-G4-G3-G1-I1-K11-K12-L2-Z	58.2
33	A-B1-C3-C2-D2-F3-G4-G3-G1-I1-K2-J6-J7-L1-Z	57.8
34	A-B1-C3-C2-D2-F3-G4-G3-G1-I1-K2-J6-J5-J8-K5-L1-Z	60.6
35	A-B1-C3-C2-D2-F3-G4-G3-G1-I1-K2-K3-K12-L2-Z	54.8



*Table 7.1 - Continuation*

<b>Route</b>	<b>Link Sequence</b>	<b>Miles</b>
36	A-B1-C3-C2-D2-F3-G4-G51-G52-I3-J1-J7-L1-Z	46.5
37	A-B1-C3-C2-D2-F3-G4-G51-G52-I3-J1-J5-J8-K5-L1-Z	49.3
38	A-B1-C3-C2-D2-F3-G4-G51-G52-I3-J21-J22-J3-J4-J8-K5-L1-Z	51.0
39	A-B1-C3-C2-D2-F3-G4-G51-G52-I3-J21-J22-J3-J4-J5-J7-L1-Z	52.2
40	A-B1-C3-C2-D2-F3-G4-G51-G52-I3-J21-J22-J3-K4-K5-L1-Z	49.2
41	A-B1-C3-C2-D2-F3-G4-G51-I2-J1-J7-L1-Z	45.7
42	A-B1-C3-C2-D2-F3-G4-G51-I2-J1-J5-J8-K5-L1-Z	48.5
43	A-B1-C3-C2-D2-F3-G4-G51-I2-J21-J22-J3-J4-J8-K5-L1-Z	50.2
44	A-B1-C3-C2-D2-F3-G4-G51-I2-J21-J22-J3-J4-J5-J7-L1-Z	51.4
45	A-B1-C3-C2-D2-F3-G4-G51-I2-J21-J22-J3-K4-K5-L1-Z	48.4
46	A-B1-C3-C2-D1-E1-F1-I1-K11-K12-L2-Z	54.9
47	A-B1-C3-C2-D1-E1-F1-I1-K2-J6-J7-L1-Z	54.5
48	A-B1-C3-C2-D1-E1-F1-I1-K2-J6-J5-J8-K5-L1-Z	57.3
49	A-B1-C3-C2-D1-E1-F1-I1-K2-K3-K12-L2-Z	51.6
50	A-B1-C3-C2-D1-E1-F1-G1-G3-G51-G52-I3-J1-J7-L1-Z	54.0
51	A-B1-C3-C2-D1-E1-F1-G1-G3-G51-G52-I3-J1-J5-J8-K5-L1-Z	56.8
52	A-B1-C3-C2-D1-E1-F1-G1-G3-G51-G52-I3-J21-J22-J3-J4-J8-K5-L1-Z	58.5
53	A-B1-C3-C2-D1-E1-F1-G1-G3-G51-G52-I3-J21-J22-J3-J4-J5-J7-L1-Z	59.6
54	A-B1-C3-C2-D1-E1-F1-G1-G3-G51-G52-I3-J21-J22-J3-K4-K5-L1-Z	56.7
55	A-B1-C3-C2-D1-E1-F1-G1-G3-G51-I2-J1-J7-L1-Z	53.2
56	A-B1-C3-C2-D1-E1-F1-G1-G3-G51-I2-J1-J5-J8-K5-L1-Z	56.0
57	A-B1-C3-C2-D1-E1-F1-G1-G3-G51-I2-J21-J22-J3-J4-J8-K5-L1-Z	57.7
58	A-B1-C3-C2-D1-E1-F1-G1-G3-G51-I2-J21-J22-J3-J4-J5-J7-L1-Z	58.8
59	A-B1-C3-C2-D1-E1-F1-G1-G3-G51-I2-J21-J22-J3-K4-K5-L1-Z	55.9
60	A-B1-C3-C2-D1-E1-F2-G2-G3-G51-G52-I3-J1-J7-L1-Z	51.0
61	A-B1-C3-C2-D1-E1-F2-G2-G3-G51-G52-I3-J1-J5-J8-K5-L1-Z	53.8
62	A-B1-C3-C2-D1-E1-F2-G2-G3-G51-G52-I3-J21-J22-J3-J4-J8-K5-L1-Z	55.5
63	A-B1-C3-C2-D1-E1-F2-G2-G3-G51-G52-I3-J21-J22-J3-J4-J5-J7-L1-Z	56.6
64	A-B1-C3-C2-D1-E1-F2-G2-G3-G51-G52-I3-J21-J22-J3-K4-K5-L1-Z	53.7
65	A-B1-C3-C2-D1-E1-F2-G2-G3-G51-I2-J1-J7-L1-Z	50.2
66	A-B1-C3-C2-D1-E1-F2-G2-G3-G51-I2-J1-J5-J8-K5-L1-Z	53.0
67	A-B1-C3-C2-D1-E1-F2-G2-G3-G51-I2-J21-J22-J3-J4-J8-K5-L1-Z	54.7
68	A-B1-C3-C2-D1-E1-F2-G2-G3-G51-I2-J21-J22-J3-J4-J5-J7-L1-Z	55.8
69	A-B1-C3-C2-D1-E1-F2-G2-G3-G51-I2-J21-J22-J3-K4-K5-L1-Z	52.9
70	A-B1-C3-C2-D1-E1-F2-G2-G1-I1-K11-K12-L2-Z	62.2

**TABLE 7-1. LINK COMPOSITION OF ALTERNATIVE ROUTES.**

<b>Route</b>	<b>Link Sequence</b>	<b>Miles</b>
71	A-B1-C3-C2-D1-E1-F2-G2-G1-I1-K2-J6-J7-L1-Z	61.8
72	A-B1-C3-C2-D1-E1-F2-G2-G1-I1-K2-J6-J5-J8-K5-L1-Z	64.6
73	A-B1-C3-C2-D1-E1-F2-G2-G1-I1-K2-K3-K12-L2-Z	58.8
74	A-B1-C3-C2-D1-E1-F2-G4-G3-G1-I1-K11-K12-L2-Z	62.5
75	A-B1-C3-C2-D1-E1-F2-G4-G3-G1-I1-K2-J6-J7-L1-Z	62.1
76	A-B1-C3-C2-D1-E1-F2-G4-G3-G1-I1-K2-J6-J5-J8-K5-L1-Z	64.9
77	A-B1-C3-C2-D1-E1-F2-G4-G3-G1-I1-K2-K3-K12-L2-Z	59.1
78	A-B1-C3-C2-D1-E1-F2-G4-G51-G52-I3-J1-J7-L1-Z	50.8
79	A-B1-C3-C2-D1-E1-F2-G4-G51-G52-I3-J1-J5-J8-K5-L1-Z	53.6
80	A-B1-C3-C2-D1-E1-F2-G4-G51-G52-I3-J21-J22-J3-J4-J8-K5-L1-Z	55.3
81	A-B1-C3-C2-D1-E1-F2-G4-G51-G52-I3-J21-J22-J3-J4-J5-J7-L1-Z	56.5
82	A-B1-C3-C2-D1-E1-F2-G4-G51-G52-I3-J21-J22-J3-K4-K5-L1-Z	53.5
83	A-B1-C3-C2-D1-E1-F2-G4-G51-I2-J1-J7-L1-Z	50.0
84	A-B1-C3-C2-D1-E1-F2-G4-G51-I2-J1-J5-J8-K5-L1-Z	52.8
85	A-B1-C3-C2-D1-E1-F2-G4-G51-I2-J21-J22-J3-J4-J8-K5-L1-Z	54.5
86	A-B1-C3-C2-D1-E1-F2-G4-G51-I2-J21-J22-J3-J4-J5-J7-L1-Z	55.6
87	A-B1-C3-C2-D1-E1-F2-G4-G51-I2-J21-J22-J3-K4-K5-L1-Z	52.7
88	A-B1-C4-D31-E4-D42-F5-H2-J22-J3-J4-J8-K5-L1-Z	54.6
89	A-B1-C4-D31-E4-D42-F5-H2-J22-J3-J4-J5-J7-L1-Z	55.7
90	A-B1-C4-D31-E4-D42-F5-H2-J22-J3-K4-K5-L1-Z	52.8
91	A-B1-C4-D31-D32-E3-E2-F3-G2-G3-G51-G52-I3-J1-J7-L1-Z	54.4
92	A-B1-C4-D31-D32-E3-E2-F3-G2-G3-G51-G52-I3-J1-J5-J8-K5-L1-Z	57.2
93	A-B1-C4-D31-D32-E3-E2-F3-G2-G3-G51-G52-I3-J21-J22-J3-J4-J8-K5-L1-Z	58.9
94	A-B1-C4-D31-D32-E3-E2-F3-G2-G3-G51-G52-I3-J21-J22-J3-J4-J5-J7-L1-Z	60.0
95	A-B1-C4-D31-D32-E3-E2-F3-G2-G3-G51-G52-I3-J21-J22-J3-K4-K5-L1-Z	57.1
96	A-B1-C4-D31-D32-E3-E2-F3-G2-G3-G51-I2-J1-J7-L1-Z	53.5
97	A-B1-C4-D31-D32-E3-E2-F3-G2-G3-G51-I2-J1-J5-J8-K5-L1-Z	56.3
98	A-B1-C4-D31-D32-E3-E2-F3-G2-G3-G51-I2-J21-J22-J3-J4-J8-K5-L1-Z	58.0
99	A-B1-C4-D31-D32-E3-E2-F3-G2-G3-G51-I2-J21-J22-J3-J4-J5-J7-L1-Z	59.2
100	A-B1-C4-D31-D32-E3-E2-F3-G2-G3-G51-I2-J21-J22-J3-K4-K5-L1-Z	56.2
101	A-B1-C4-D31-D32-E3-E2-F3-G2-G1-I1-K11-K12-L2-Z	65.5
102	A-B1-C4-D31-D32-E3-E2-F3-G2-G1-I1-K2-J6-J7-L1-Z	65.2
103	A-B1-C4-D31-D32-E3-E2-F3-G2-G1-I1-K2-J6-J5-J8-K5-L1-Z	67.9
104	A-B1-C4-D31-D32-E3-E2-F3-G2-G1-I1-K2-K3-K12-L2-Z	62.2
105	A-B1-C4-D31-D32-E3-E2-F3-G4-G3-G1-I1-K11-K12-L2-Z	65.8

*Table 7.1 - Continuation*

<b>Route</b>	<b>Link Sequence</b>	<b>Miles</b>
106	A-B1-C4-D31-D32-E3-E2-F3-G4-G3-G1-I1-K2-J6-J7-L1-Z	65.5
107	A-B1-C4-D31-D32-E3-E2-F3-G4-G3-G1-I1-K2-J6-J5-J8-K5-L1-Z	68.2
108	A-B1-C4-D31-D32-E3-E2-F3-G4-G3-G1-I1-K2-K3-K12-L2-Z	62.5
109	A-B1-C4-D31-D32-E3-E2-F3-G4-G51-G52-I3-J1-J7-L1-Z	54.2
110	A-B1-C4-D31-D32-E3-E2-F3-G4-G51-G52-I3-J1-J5-J8-K5-L1-Z	57.0
111	A-B1-C4-D31-D32-E3-E2-F3-G4-G51-G52-I3-J21-J22-J3-J4-J8-K5-L1-Z	58.7
112	A-B1-C4-D31-D32-E3-E2-F3-G4-G51-G52-I3-J21-J22-J3-J4-J5-J7-L1-Z	59.8
113	A-B1-C4-D31-D32-E3-E2-F3-G4-G51-G52-I3-J21-J22-J3-K4-K5-L1-Z	56.9
114	A-B1-C4-D31-D32-E3-E2-F3-G4-G51-I2-J1-J7-L1-Z	53.4
115	A-B1-C4-D31-D32-E3-E2-F3-G4-G51-I2-J1-J5-J8-K5-L1-Z	56.2
116	A-B1-C4-D31-D32-E3-E2-F3-G4-G51-I2-J21-J22-J3-J4-J8-K5-L1-Z	57.9
117	A-B1-C4-D31-D32-E3-E2-F3-G4-G51-I2-J21-J22-J3-J4-J5-J7-L1-Z	59.0
118	A-B1-C4-D31-D32-E3-E2-F3-G4-G51-I2-J21-J22-J3-K4-K5-L1-Z	56.1
119	A-B1-C4-D31-D32-E3-F4-G6-H2-J22-J3-J4-J8-K5-L1-Z	54.7
120	A-B1-C4-D31-D32-E3-F4-G6-H2-J22-J3-J4-J5-J7-L1-Z	55.8
121	A-B1-C4-D31-D32-E3-F4-G6-H2-J22-J3-K4-K5-L1-Z	52.9
122	A-B1-C4-D31-D32-E3-F4-H1-G52-I2-J1-J7-L1-Z	53.2
123	A-B1-C4-D31-D32-E3-F4-H1-G52-I2-J1-J5-J8-K5-L1-Z	56.0
124	A-B1-C4-D31-D32-E3-F4-H1-G52-I2-J21-J22-J3-J4-J8-K5-L1-Z	57.7
125	A-B1-C4-D31-D32-E3-F4-H1-G52-I2-J21-J22-J3-J4-J5-J7-L1-Z	58.9
126	A-B1-C4-D31-D32-E3-F4-H1-G52-I2-J21-J22-J3-K4-K5-L1-Z	55.9
127	A-B1-C4-D31-D32-E3-F4-H1-G52-G51-G3-G1-I1-K11-K12-L2-Z	67.1
128	A-B1-C4-D31-D32-E3-F4-H1-G52-G51-G3-G1-I1-K2-J6-J7-L1-Z	66.7
129	A-B1-C4-D31-D32-E3-F4-H1-G52-G51-G3-G1-I1-K2-J6-J5-J8-K5-L1-Z	69.5
130	A-B1-C4-D31-D32-E3-F4-H1-G52-G51-G3-G1-I1-K2-K3-K12-L2-Z	63.7
131	A-B1-C4-D31-D32-E3-F4-H1-I3-J1-J7-L1-Z	51.3
132	A-B1-C4-D31-D32-E3-F4-H1-I3-J1-J5-J8-K5-L1-Z	54.1
133	A-B1-C4-D31-D32-E3-F4-H1-I3-J21-J22-J3-J4-J8-K5-L1-Z	55.8
134	A-B1-C4-D31-D32-E3-F4-H1-I3-J21-J22-J3-J4-J5-J7-L1-Z	56.9
135	A-B1-C4-D31-D32-E3-F4-H1-I3-J21-J22-J3-K4-K5-L1-Z	54.0
136	A-B1-C4-D41-E4-D32-E3-E2-F3-G2-G3-G51-G52-I3-J1-J7-L1-Z	64.4
137	A-B1-C4-D41-E4-D32-E3-E2-F3-G2-G3-G51-G52-I3-J1-J5-J8-K5-L1-Z	67.2
138	A-B1-C4-D41-E4-D32-E3-E2-F3-G2-G3-G51-G52-I3-J21-J22-J3-J4-J8-K5-L1-Z	68.9
139	A-B1-C4-D41-E4-D32-E3-E2-F3-G2-G3-G51-G52-I3-J21-J22-J3-J4-J5-J7-L1-Z	70.1
140	A-B1-C4-D41-E4-D32-E3-E2-F3-G2-G3-G51-G52-I3-J21-J22-J3-K4-K5-L1-Z	67.1



**TABLE 7-1. LINK COMPOSITION OF ALTERNATIVE ROUTES.**

<b>Route</b>	<b>Link Sequence</b>	<b>Miles</b>
141	A-B1-C4-D41-E4-D32-E3-E2-F3-G2-G3-G51-I2-J1-J7-L1-Z	63.6
142	A-B1-C4-D41-E4-D32-E3-E2-F3-G2-G3-G51-I2-J1-J5-J8-K5-L1-Z	66.4
143	A-B1-C4-D41-E4-D32-E3-E2-F3-G2-G3-G51-I2-J21-J22-J3-J4-J8-K5-L1-Z	68.1
144	A-B1-C4-D41-E4-D32-E3-E2-F3-G2-G3-G51-I2-J21-J22-J3-J4-J5-J7-L1-Z	69.2
145	A-B1-C4-D41-E4-D32-E3-E2-F3-G2-G3-G51-I2-J21-J22-J3-K4-K5-L1-Z	66.3
146	A-B1-C4-D41-E4-D32-E3-E2-F3-G2-G1-I1-K11-K12-L2-Z	75.6
147	A-B1-C4-D41-E4-D32-E3-E2-F3-G2-G1-I1-K2-J6-J7-L1-Z	75.2
148	A-B1-C4-D41-E4-D32-E3-E2-F3-G2-G1-I1-K2-J6-J5-J8-K5-L1-Z	78.0
149	A-B1-C4-D41-E4-D32-E3-E2-F3-G2-G1-I1-K2-K3-K12-L2-Z	72.3
150	A-B1-C4-D41-E4-D32-E3-E2-F3-G4-G3-G1-I1-K11-K12-L2-Z	75.9
151	A-B1-C4-D41-E4-D32-E3-E2-F3-G4-G3-G1-I1-K2-J6-J7-L1-Z	75.5
152	A-B1-C4-D41-E4-D32-E3-E2-F3-G4-G3-G1-I1-K2-J6-J5-J8-K5-L1-Z	78.3
153	A-B1-C4-D41-E4-D32-E3-E2-F3-G4-G3-G1-I1-K2-K3-K12-L2-Z	72.6
154	A-B1-C4-D41-E4-D32-E3-E2-F3-G4-G51-G52-I3-J1-J7-L1-Z	64.3
155	A-B1-C4-D41-E4-D32-E3-E2-F3-G4-G51-G52-I3-J1-J5-J8-K5-L1-Z	67.0
156	A-B1-C4-D41-E4-D32-E3-E2-F3-G4-G51-G52-I3-J21-J22-J3-J4-J8-K5-L1-Z	68.8
157	A-B1-C4-D41-E4-D32-E3-E2-F3-G4-G51-G52-I3-J21-J22-J3-J4-J5-J7-L1-Z	69.9
158	A-B1-C4-D41-E4-D32-E3-E2-F3-G4-G51-G52-I3-J21-J22-J3-K4-K5-L1-Z	67.0
159	A-B1-C4-D41-E4-D32-E3-E2-F3-G4-G51-I2-J1-J7-L1-Z	63.4
160	A-B1-C4-D41-E4-D32-E3-E2-F3-G4-G51-I2-J1-J5-J8-K5-L1-Z	66.2
161	A-B1-C4-D41-E4-D32-E3-E2-F3-G4-G51-I2-J21-J22-J3-J4-J8-K5-L1-Z	67.9
162	A-B1-C4-D41-E4-D32-E3-E2-F3-G4-G51-I2-J21-J22-J3-J4-J5-J7-L1-Z	69.1
163	A-B1-C4-D41-E4-D32-E3-E2-F3-G4-G51-I2-J21-J22-J3-K4-K5-L1-Z	66.1
164	A-B1-C4-D41-E4-D32-E3-F4-G6-H2-J22-J3-J4-J8-K5-L1-Z	64.8
165	A-B1-C4-D41-E4-D32-E3-F4-G6-H2-J22-J3-J4-J5-J7-L1-Z	65.9
166	A-B1-C4-D41-E4-D32-E3-F4-G6-H2-J22-J3-K4-K5-L1-Z	63.0
167	A-B1-C4-D41-E4-D32-E3-F4-H1-G52-I2-J1-J7-L1-Z	63.3
168	A-B1-C4-D41-E4-D32-E3-F4-H1-G52-I2-J1-J5-J8-K5-L1-Z	66.1
169	A-B1-C4-D41-E4-D32-E3-F4-H1-G52-I2-J21-J22-J3-J4-J8-K5-L1-Z	67.8
170	A-B1-C4-D41-E4-D32-E3-F4-H1-G52-I2-J21-J22-J3-J4-J5-J7-L1-Z	68.9
171	A-B1-C4-D41-E4-D32-E3-F4-H1-G52-I2-J21-J22-J3-K4-K5-L1-Z	66.0
172	A-B1-C4-D41-E4-D32-E3-F4-H1-G52-G51-G3-G1-I1-K11-K12-L2-Z	77.1
173	A-B1-C4-D41-E4-D32-E3-F4-H1-G52-G51-G3-G1-I1-K2-J6-J7-L1-Z	76.7
174	A-B1-C4-D41-E4-D32-E3-F4-H1-G52-G51-G3-G1-I1-K2-J6-J5-J8-K5-L1-Z	79.5
175	A-B1-C4-D41-E4-D32-E3-F4-H1-G52-G51-G3-G1-I1-K2-K3-K12-L2-Z	73.8

*Table 7.1 - Continuation*

<b>Route</b>	<b>Link Sequence</b>	<b>Miles</b>
176	A-B1-C4-D41-E4-D32-E3-F4-H1-I3-J1-J7-L1-Z	61.4
177	A-B1-C4-D41-E4-D32-E3-F4-H1-I3-J1-J5-J8-K5-L1-Z	64.1
178	A-B1-C4-D41-E4-D32-E3-F4-H1-I3-J21-J22-J3-J4-J8-K5-L1-Z	65.9
179	A-B1-C4-D41-E4-D32-E3-F4-H1-I3-J21-J22-J3-J4-J5-J7-L1-Z	67.0
180	A-B1-C4-D41-E4-D32-E3-F4-H1-I3-J21-J22-J3-K4-K5-L1-Z	64.1
181	A-B1-C4-D41-D42-F5-H2-J22-J3-J4-J8-K5-L1-Z	60.5
182	A-B1-C4-D41-D42-F5-H2-J22-J3-J4-J5-J7-L1-Z	61.6
183	A-B1-C4-D41-D42-F5-H2-J22-J3-K4-K5-L1-Z	58.7
184	A-B2-B3-C3-C4-D31-E4-D42-F5-H2-J22-J3-J4-J8-K5-L1-Z	55.4
185	A-B2-B3-C3-C4-D31-E4-D42-F5-H2-J22-J3-J4-J5-J7-L1-Z	56.6
186	A-B2-B3-C3-C4-D31-E4-D42-F5-H2-J22-J3-K4-K5-L1-Z	53.6
187	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G2-G3-G51-G52-I3-J1-J7-L1-Z	55.2
188	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G2-G3-G51-G52-I3-J1-J5-J8-K5-L1-Z	58.0
189	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G2-G3-G51-G52-I3-J21-J22-J3-J4-J8-K5-L1-Z	59.7
190	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G2-G3-G51-G52-I3-J21-J22-J3-J4-J5-J7-L1-Z	60.8
191	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G2-G3-G51-G52-I3-J21-J22-J3-K4-K5-L1-Z	57.9
192	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G2-G3-G51-I2-J1-J7-L1-Z	54.4
193	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G2-G3-G51-I2-J1-J5-J8-K5-L1-Z	57.2
194	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G2-G3-G51-I2-J21-J22-J3-J4-J8-K5-L1-Z	58.9
195	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G2-G3-G51-I2-J21-J22-J3-J4-J5-J7-L1-Z	60.0
196	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G2-G3-G51-I2-J21-J22-J3-K4-K5-L1-Z	57.1
197	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G2-G1-I1-K11-K12-L2-Z	66.4
198	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G2-G1-I1-K2-J6-J7-L1-Z	66.0
199	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G2-G1-I1-K2-J6-J5-J8-K5-L1-Z	68.8
200	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G2-G1-I1-K2-K3-K12-L2-Z	63.0
201	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G4-G3-G1-I1-K11-K12-L2-Z	66.7
202	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G4-G3-G1-I1-K2-J6-J7-L1-Z	66.3
203	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G4-G3-G1-I1-K2-J6-J5-J8-K5-L1-Z	69.1
204	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G4-G3-G1-I1-K2-K3-K12-L2-Z	63.3
205	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G4-G51-G52-I3-J1-J7-L1-Z	55.0
206	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G4-G51-G52-I3-J1-J5-J8-K5-L1-Z	57.8
207	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G4-G51-G52-I3-J21-J22-J3-J4-J8-K5-L1-Z	59.5
208	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G4-G51-G52-I3-J21-J22-J3-J4-J5-J7-L1-Z	60.7
209	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G4-G51-G52-I3-J21-J22-J3-K4-K5-L1-Z	57.7
210	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G4-G51-I2-J1-J7-L1-Z	54.2

**TABLE 7-1. LINK COMPOSITION OF ALTERNATIVE ROUTES.**

<b>Route</b>	<b>Link Sequence</b>	<b>Miles</b>
211	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G4-G51-I2-J1-J5-J8-K5-L1-Z	57.0
212	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G4-G51-I2-J21-J22-J3-J4-J8-K5-L1-Z	58.7
213	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G4-G51-I2-J21-J22-J3-J4-J5-J7-L1-Z	59.8
214	A-B2-B3-C3-C4-D31-D32-E3-E2-F3-G4-G51-I2-J21-J22-J3-K4-K5-L1-Z	56.9
215	A-B2-B3-C3-C4-D31-D32-E3-F4-G6-H2-J22-J3-J4-J8-K5-L1-Z	55.5
216	A-B2-B3-C3-C4-D31-D32-E3-F4-G6-H2-J22-J3-J4-J5-J7-L1-Z	56.7
217	A-B2-B3-C3-C4-D31-D32-E3-F4-G6-H2-J22-J3-K4-K5-L1-Z	53.7
218	A-B2-B3-C3-C4-D31-D32-E3-F4-H1-G52-I2-J1-J7-L1-Z	54.1
219	A-B2-B3-C3-C4-D31-D32-E3-F4-H1-G52-I2-J1-J5-J8-K5-L1-Z	56.9
220	A-B2-B3-C3-C4-D31-D32-E3-F4-H1-G52-I2-J21-J22-J3-J4-J8-K5-L1-Z	58.6
221	A-B2-B3-C3-C4-D31-D32-E3-F4-H1-G52-I2-J21-J22-J3-J4-J5-J7-L1-Z	59.7
222	A-B2-B3-C3-C4-D31-D32-E3-F4-H1-G52-I2-J21-J22-J3-K4-K5-L1-Z	56.8
223	A-B2-B3-C3-C4-D31-D32-E3-F4-H1-G52-G51-G3-G1-I1-K11-K12-L2-Z	67.9
224	A-B2-B3-C3-C4-D31-D32-E3-F4-H1-G52-G51-G3-G1-I1-K2-J6-J7-L1-Z	67.5
225	A-B2-B3-C3-C4-D31-D32-E3-F4-H1-G52-G51-G3-G1-I1-K2-J6-J5-J8-K5-L1-Z	70.3
226	A-B2-B3-C3-C4-D31-D32-E3-F4-H1-G52-G51-G3-G1-I1-K2-K3-K12-L2-Z	64.6
227	A-B2-B3-C3-C4-D31-D32-E3-F4-H1-I3-J1-J7-L1-Z	52.1
228	A-B2-B3-C3-C4-D31-D32-E3-F4-H1-I3-J1-J5-J8-K5-L1-Z	54.9
229	A-B2-B3-C3-C4-D31-D32-E3-F4-H1-I3-J21-J22-J3-J4-J8-K5-L1-Z	56.6
230	A-B2-B3-C3-C4-D31-D32-E3-F4-H1-I3-J21-J22-J3-J4-J5-J7-L1-Z	57.8
231	A-B2-B3-C3-C4-D31-D32-E3-F4-H1-I3-J21-J22-J3-K4-K5-L1-Z	54.8
232	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G2-G3-G51-G52-I3-J1-J7-L1-Z	65.3
233	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G2-G3-G51-G52-I3-J1-J5-J8-K5-L1-Z	68.1
234	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G2-G3-G51-G52-I3-J21-J22-J3-J4-J8-K5-L1-Z	69.8
235	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G2-G3-G51-G52-I3-J21-J22-J3-J4-J5-J7-L1-Z	70.9
236	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G2-G3-G51-G52-I3-J21-J22-J3-K4-K5-L1-Z	68.0
237	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G2-G3-G51-I2-J1-J7-L1-Z	64.4
238	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G2-G3-G51-I2-J1-J5-J8-K5-L1-Z	67.2
239	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G2-G3-G51-I2-J21-J22-J3-J4-J8-K5-L1-Z	68.9
240	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G2-G3-G51-I2-J21-J22-J3-J4-J5-J7-L1-Z	70.1
241	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G2-G3-G51-I2-J21-J22-J3-K4-K5-L1-Z	67.1
242	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G2-G1-I1-K11-K12-L2-Z	76.4
243	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G2-G1-I1-K2-J6-J7-L1-Z	76.1
244	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G2-G1-I1-K2-J6-J5-J8-K5-L1-Z	78.8
245	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G2-G1-I1-K2-K3-K12-L2-Z	73.1

*Table 7.1 - Continuation*

<b>Route</b>	<b>Link Sequence</b>	<b>Miles</b>
246	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G4-G3-G1-I1-K11-K12-L2-Z	76.7
247	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G4-G3-G1-I1-K2-J6-J7-L1-Z	76.4
248	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G4-G3-G1-I1-K2-J6-J5-J8-K5-L1-Z	79.1
249	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G4-G3-G1-I1-K2-K3-K12-L2-Z	73.4
250	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G4-G51-G52-I3-J1-J7-L1-Z	65.1
251	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G4-G51-G52-I3-J1-J5-J8-K5-L1-Z	67.9
252	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G4-G51-G52-I3-J21-J22-J3-J4-J8-K5-L1-Z	69.6
253	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G4-G51-G52-I3-J21-J22-J3-J4-J5-J7-L1-Z	70.7
254	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G4-G51-G52-I3-J21-J22-J3-K4-K5-L1-Z	67.8
255	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G4-G51-I2-J1-J7-L1-Z	64.3
256	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G4-G51-I2-J1-J5-J8-K5-L1-Z	67.1
257	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G4-G51-I2-J21-J22-J3-J4-J8-K5-L1-Z	68.8
258	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G4-G51-I2-J21-J22-J3-J4-J5-J7-L1-Z	69.9
259	A-B2-B3-C3-C4-D41-E4-D32-E3-E2-F3-G4-G51-I2-J21-J22-J3-K4-K5-L1-Z	67.0
260	A-B2-B3-C3-C4-D41-E4-D32-E3-F4-G6-H2-J22-J3-J4-J8-K5-L1-Z	65.6
261	A-B2-B3-C3-C4-D41-E4-D32-E3-F4-G6-H2-J22-J3-J4-J5-J7-L1-Z	66.7
262	A-B2-B3-C3-C4-D41-E4-D32-E3-F4-G6-H2-J22-J3-K4-K5-L1-Z	63.8
263	A-B2-B3-C3-C4-D41-E4-D32-E3-F4-H1-G52-I2-J1-J7-L1-Z	64.1
264	A-B2-B3-C3-C4-D41-E4-D32-E3-F4-H1-G52-I2-J1-J5-J8-K5-L1-Z	66.9
265	A-B2-B3-C3-C4-D41-E4-D32-E3-F4-H1-G52-I2-J21-J22-J3-J4-J8-K5-L1-Z	68.6
266	A-B2-B3-C3-C4-D41-E4-D32-E3-F4-H1-G52-I2-J21-J22-J3-J4-J5-J7-L1-Z	69.8
267	A-B2-B3-C3-C4-D41-E4-D32-E3-F4-H1-G52-I2-J21-J22-J3-K4-K5-L1-Z	66.8
268	A-B2-B3-C3-C4-D41-E4-D32-E3-F4-H1-G52-G51-G3-G1-I1-K11-K12-L2-Z	78.0
269	A-B2-B3-C3-C4-D41-E4-D32-E3-F4-H1-G52-G51-G3-G1-I1-K2-J6-J7-L1-Z	77.6
270	A-B2-B3-C3-C4-D41-E4-D32-E3-F4-H1-G52-G51-G3-G1-I1-K2-J6-J5-J8-K5-L1-Z	80.4
271	A-B2-B3-C3-C4-D41-E4-D32-E3-F4-H1-G52-G51-G3-G1-I1-K2-K3-K12-L2-Z	74.6
272	A-B2-B3-C3-C4-D41-E4-D32-E3-F4-H1-I3-J1-J7-L1-Z	62.2
273	A-B2-B3-C3-C4-D41-E4-D32-E3-F4-H1-I3-J1-J5-J8-K5-L1-Z	65.0
274	A-B2-B3-C3-C4-D41-E4-D32-E3-F4-H1-I3-J21-J22-J3-J4-J8-K5-L1-Z	66.7
275	A-B2-B3-C3-C4-D41-E4-D32-E3-F4-H1-I3-J21-J22-J3-J4-J5-J7-L1-Z	67.8
276	A-B2-B3-C3-C4-D41-E4-D32-E3-F4-H1-I3-J21-J22-J3-K4-K5-L1-Z	64.9
277	A-B2-B3-C3-C4-D41-D42-F5-H2-J22-J3-J4-J8-K5-L1-Z	61.3
278	A-B2-B3-C3-C4-D41-D42-F5-H2-J22-J3-J4-J5-J7-L1-Z	62.5
279	A-B2-B3-C3-C4-D41-D42-F5-H2-J22-J3-K4-K5-L1-Z	59.5
280	A-B2-B3-C2-D2-E2-F4-G6-H2-J22-J3-J4-J8-K5-L1-Z	50.6



**TABLE 7-1. LINK COMPOSITION OF ALTERNATIVE ROUTES.**

<b>Route</b>	<b>Link Sequence</b>	<b>Miles</b>
281	A-B2-B3-C2-D2-E2-F4-G6-H2-J22-J3-J4-J5-J7-L1-Z	51.7
282	A-B2-B3-C2-D2-E2-F4-G6-H2-J22-J3-K4-K5-L1-Z	48.8
283	A-B2-B3-C2-D2-E2-F4-H1-G52-I2-J1-J7-L1-Z	49.1
284	A-B2-B3-C2-D2-E2-F4-H1-G52-I2-J1-J5-J8-K5-L1-Z	51.9
285	A-B2-B3-C2-D2-E2-F4-H1-G52-I2-J21-J22-J3-J4-J8-K5-L1-Z	53.6
286	A-B2-B3-C2-D2-E2-F4-H1-G52-I2-J21-J22-J3-J4-J5-J7-L1-Z	54.8
287	A-B2-B3-C2-D2-E2-F4-H1-G52-I2-J21-J22-J3-K4-K5-L1-Z	51.8
288	A-B2-B3-C2-D2-E2-F4-H1-G52-G51-G3-G1-I1-K11-K12-L2-Z	63.0
289	A-B2-B3-C2-D2-E2-F4-H1-G52-G51-G3-G1-I1-K2-J6-J7-L1-Z	62.6
290	A-B2-B3-C2-D2-E2-F4-H1-G52-G51-G3-G1-I1-K2-J6-J5-J8-K5-L1-Z	65.4
291	A-B2-B3-C2-D2-E2-F4-H1-G52-G51-G3-G1-I1-K2-K3-K12-L2-Z	59.6
292	A-B2-B3-C2-D2-E2-F4-H1-I3-J1-J7-L1-Z	47.2
293	A-B2-B3-C2-D2-E2-F4-H1-I3-J1-J5-J8-K5-L1-Z	50.0
294	A-B2-B3-C2-D2-E2-F4-H1-I3-J21-J22-J3-J4-J8-K5-L1-Z	51.7
295	A-B2-B3-C2-D2-E2-F4-H1-I3-J21-J22-J3-J4-J5-J7-L1-Z	52.8
296	A-B2-B3-C2-D2-E2-F4-H1-I3-J21-J22-J3-K4-K5-L1-Z	49.9
297	A-B2-B3-C2-D2-F3-G2-G3-G51-G52-I3-J1-J7-L1-Z	45.5
298	A-B2-B3-C2-D2-F3-G2-G3-G51-G52-I3-J1-J5-J8-K5-L1-Z	48.3
299	A-B2-B3-C2-D2-F3-G2-G3-G51-G52-I3-J21-J22-J3-J4-J8-K5-L1-Z	50.0
300	A-B2-B3-C2-D2-F3-G2-G3-G51-G52-I3-J21-J22-J3-J4-J5-J7-L1-Z	51.2
301	A-B2-B3-C2-D2-F3-G2-G3-G51-G52-I3-J21-J22-J3-K4-K5-L1-Z	48.2
302	A-B2-B3-C2-D2-F3-G2-G3-G51-I2-J1-J7-L1-Z	44.7
303	A-B2-B3-C2-D2-F3-G2-G3-G51-I2-J1-J5-J8-K5-L1-Z	47.5
304	A-B2-B3-C2-D2-F3-G2-G3-G51-I2-J21-J22-J3-J4-J8-K5-L1-Z	49.2
305	A-B2-B3-C2-D2-F3-G2-G3-G51-I2-J21-J22-J3-J4-J5-J7-L1-Z	50.4
306	A-B2-B3-C2-D2-F3-G2-G3-G51-I2-J21-J22-J3-K4-K5-L1-Z	47.4
307	A-B2-B3-C2-D2-F3-G2-G1-I1-K11-K12-L2-Z	56.7
308	A-B2-B3-C2-D2-F3-G2-G1-I1-K2-J6-J7-L1-Z	56.3
309	A-B2-B3-C2-D2-F3-G2-G1-I1-K2-J6-J5-J8-K5-L1-Z	59.1
310	A-B2-B3-C2-D2-F3-G2-G1-I1-K2-K3-K12-L2-Z	53.4
311	A-B2-B3-C2-D2-F3-G4-G3-G1-I1-K11-K12-L2-Z	57.0
312	A-B2-B3-C2-D2-F3-G4-G3-G1-I1-K2-J6-J7-L1-Z	56.6
313	A-B2-B3-C2-D2-F3-G4-G3-G1-I1-K2-J6-J5-J8-K5-L1-Z	59.4
314	A-B2-B3-C2-D2-F3-G4-G3-G1-I1-K2-K3-K12-L2-Z	53.7
315	A-B2-B3-C2-D2-F3-G4-G51-G52-I3-J1-J7-L1-Z	45.4

*Table 7.1 - Continuation*

<b>Route</b>	<b>Link Sequence</b>	<b>Miles</b>
316	A-B2-B3-C2-D2-F3-G4-G51-G52-I3-J1-J5-J8-K5-L1-Z	48.2
317	A-B2-B3-C2-D2-F3-G4-G51-G52-I3-J21-J22-J3-J4-J8-K5-L1-Z	49.9
318	A-B2-B3-C2-D2-F3-G4-G51-G52-I3-J21-J22-J3-J4-J5-J7-L1-Z	51.0
319	A-B2-B3-C2-D2-F3-G4-G51-G52-I3-J21-J22-J3-K4-K5-L1-Z	48.1
320	A-B2-B3-C2-D2-F3-G4-G51-I2-J1-J7-L1-Z	44.5
321	A-B2-B3-C2-D2-F3-G4-G51-I2-J1-J5-J8-K5-L1-Z	47.3
322	A-B2-B3-C2-D2-F3-G4-G51-I2-J21-J22-J3-J4-J8-K5-L1-Z	49.0
323	A-B2-B3-C2-D2-F3-G4-G51-I2-J21-J22-J3-J4-J5-J7-L1-Z	50.2
324	A-B2-B3-C2-D2-F3-G4-G51-I2-J21-J22-J3-K4-K5-L1-Z	47.2
325	A-B2-B3-C2-D1-E1-F1-I1-K11-K12-L2-Z	53.7
326	A-B2-B3-C2-D1-E1-F1-I1-K2-J6-J7-L1-Z	53.3
327	A-B2-B3-C2-D1-E1-F1-I1-K2-J6-J5-J8-K5-L1-Z	56.1
328	A-B2-B3-C2-D1-E1-F1-I1-K2-K3-K12-L2-Z	50.4
329	A-B2-B3-C2-D1-E1-F1-G1-G3-G51-G52-I3-J1-J7-L1-Z	52.8
330	A-B2-B3-C2-D1-E1-F1-G1-G3-G51-G52-I3-J1-J5-J8-K5-L1-Z	55.6
331	A-B2-B3-C2-D1-E1-F1-G1-G3-G51-G52-I3-J21-J22-J3-J4-J8-K5-L1-Z	57.3
332	A-B2-B3-C2-D1-E1-F1-G1-G3-G51-G52-I3-J21-J22-J3-J4-J5-J7-L1-Z	58.5
333	A-B2-B3-C2-D1-E1-F1-G1-G3-G51-G52-I3-J21-J22-J3-K4-K5-L1-Z	55.5
334	A-B2-B3-C2-D1-E1-F1-G1-G3-G51-I2-J1-J7-L1-Z	52.0
335	A-B2-B3-C2-D1-E1-F1-G1-G3-G51-I2-J1-J5-J8-K5-L1-Z	54.8
336	A-B2-B3-C2-D1-E1-F1-G1-G3-G51-I2-J21-J22-J3-J4-J8-K5-L1-Z	56.5
337	A-B2-B3-C2-D1-E1-F1-G1-G3-G51-I2-J21-J22-J3-J4-J5-J7-L1-Z	57.6
338	A-B2-B3-C2-D1-E1-F1-G1-G3-G51-I2-J21-J22-J3-K4-K5-L1-Z	54.7
339	A-B2-B3-C2-D1-E1-F2-G2-G3-G51-G52-I3-J1-J7-L1-Z	49.8
340	A-B2-B3-C2-D1-E1-F2-G2-G3-G51-G52-I3-J1-J5-J8-K5-L1-Z	52.6
341	A-B2-B3-C2-D1-E1-F2-G2-G3-G51-G52-I3-J21-J22-J3-J4-J8-K5-L1-Z	54.3
342	A-B2-B3-C2-D1-E1-F2-G2-G3-G51-G52-I3-J21-J22-J3-J4-J5-J7-L1-Z	55.5
343	A-B2-B3-C2-D1-E1-F2-G2-G3-G51-G52-I3-J21-J22-J3-K4-K5-L1-Z	52.5
344	A-B2-B3-C2-D1-E1-F2-G2-G3-G51-I2-J1-J7-L1-Z	49.0
345	A-B2-B3-C2-D1-E1-F2-G2-G3-G51-I2-J1-J5-J8-K5-L1-Z	51.8
346	A-B2-B3-C2-D1-E1-F2-G2-G3-G51-I2-J21-J22-J3-J4-J8-K5-L1-Z	53.5
347	A-B2-B3-C2-D1-E1-F2-G2-G3-G51-I2-J21-J22-J3-J4-J5-J7-L1-Z	54.7
348	A-B2-B3-C2-D1-E1-F2-G2-G3-G51-I2-J21-J22-J3-K4-K5-L1-Z	51.7
349	A-B2-B3-C2-D1-E1-F2-G2-G1-I1-K11-K12-L2-Z	61.0
350	A-B2-B3-C2-D1-E1-F2-G2-G1-I1-K2-J6-J7-L1-Z	60.6

**TABLE 7-1. LINK COMPOSITION OF ALTERNATIVE ROUTES.**

<b>Route</b>	<b>Link Sequence</b>	<b>Miles</b>
351	A-B2-B3-C2-D1-E1-F2-G2-G1-I1-K2-J6-J5-J8-K5-L1-Z	63.4
352	A-B2-B3-C2-D1-E1-F2-G2-G1-I1-K2-K3-K12-L2-Z	57.7
353	A-B2-B3-C2-D1-E1-F2-G4-G3-G1-I1-K11-K12-L2-Z	61.3
354	A-B2-B3-C2-D1-E1-F2-G4-G3-G1-I1-K2-J6-J7-L1-Z	60.9
355	A-B2-B3-C2-D1-E1-F2-G4-G3-G1-I1-K2-J6-J5-J8-K5-L1-Z	63.7
356	A-B2-B3-C2-D1-E1-F2-G4-G3-G1-I1-K2-K3-K12-L2-Z	58.0
357	A-B2-B3-C2-D1-E1-F2-G4-G51-G52-I3-J1-J7-L1-Z	49.7
358	A-B2-B3-C2-D1-E1-F2-G4-G51-G52-I3-J1-J5-J8-K5-L1-Z	52.5
359	A-B2-B3-C2-D1-E1-F2-G4-G51-G52-I3-J21-J22-J3-J4-J8-K5-L1-Z	54.2
360	A-B2-B3-C2-D1-E1-F2-G4-G51-G52-I3-J21-J22-J3-J4-J5-J7-L1-Z	55.3
361	A-B2-B3-C2-D1-E1-F2-G4-G51-G52-I3-J21-J22-J3-K4-K5-L1-Z	52.4
362	A-B2-B3-C2-D1-E1-F2-G4-G51-I2-J1-J7-L1-Z	48.8
363	A-B2-B3-C2-D1-E1-F2-G4-G51-I2-J1-J5-J8-K5-L1-Z	51.6
364	A-B2-B3-C2-D1-E1-F2-G4-G51-I2-J21-J22-J3-J4-J8-K5-L1-Z	53.3
365	A-B2-B3-C2-D1-E1-F2-G4-G51-I2-J21-J22-J3-J4-J5-J7-L1-Z	54.5
366	A-B2-B3-C2-D1-E1-F2-G4-G51-I2-J21-J22-J3-K4-K5-L1-Z	51.5
367	A-B2-C1-E1-F1-I1-K11-K12-L2-Z	61.2
368	A-B2-C1-E1-F1-I1-K2-J6-J7-L1-Z	60.8
369	A-B2-C1-E1-F1-I1-K2-J6-J5-J8-K5-L1-Z	63.6
370	A-B2-C1-E1-F1-I1-K2-K3-K12-L2-Z	57.9
371	A-B2-C1-E1-F1-G1-G3-G51-G52-I3-J1-J7-L1-Z	60.3
372	A-B2-C1-E1-F1-G1-G3-G51-G52-I3-J1-J5-J8-K5-L1-Z	63.1
373	A-B2-C1-E1-F1-G1-G3-G51-G52-I3-J21-J22-J3-J4-J8-K5-L1-Z	64.8
374	A-B2-C1-E1-F1-G1-G3-G51-G52-I3-J21-J22-J3-J4-J5-J7-L1-Z	65.9
375	A-B2-C1-E1-F1-G1-G3-G51-G52-I3-J21-J22-J3-K4-K5-L1-Z	63.0
376	A-B2-C1-E1-F1-G1-G3-G51-I2-J1-J7-L1-Z	59.5
377	A-B2-C1-E1-F1-G1-G3-G51-I2-J1-J5-J8-K5-L1-Z	62.3
378	A-B2-C1-E1-F1-G1-G3-G51-I2-J21-J22-J3-J4-J8-K5-L1-Z	64.0
379	A-B2-C1-E1-F1-G1-G3-G51-I2-J21-J22-J3-J4-J5-J7-L1-Z	65.1
380	A-B2-C1-E1-F1-G1-G3-G51-I2-J21-J22-J3-K4-K5-L1-Z	62.2
381	A-B2-C1-E1-F2-G2-G3-G51-G52-I3-J1-J7-L1-Z	57.3
382	A-B2-C1-E1-F2-G2-G3-G51-G52-I3-J1-J5-J8-K5-L1-Z	60.1
383	A-B2-C1-E1-F2-G2-G3-G51-G52-I3-J21-J22-J3-J4-J8-K5-L1-Z	61.8
384	A-B2-C1-E1-F2-G2-G3-G51-G52-I3-J21-J22-J3-J4-J5-J7-L1-Z	63.0
385	A-B2-C1-E1-F2-G2-G3-G51-G52-I3-J21-J22-J3-K4-K5-L1-Z	60.0

*Table 7.1 - Continuation*

<b>Route</b>	<b>Link Sequence</b>	<b>Miles</b>
386	A-B2-C1-E1-F2-G2-G3-G51-I2-J1-J7-L1-Z	56.5
387	A-B2-C1-E1-F2-G2-G3-G51-I2-J1-J5-J8-K5-L1-Z	59.3
388	A-B2-C1-E1-F2-G2-G3-G51-I2-J21-J22-J3-J4-J8-K5-L1-Z	61.0
389	A-B2-C1-E1-F2-G2-G3-G51-I2-J21-J22-J3-J4-J5-J7-L1-Z	62.1
390	A-B2-C1-E1-F2-G2-G3-G51-I2-J21-J22-J3-K4-K5-L1-Z	59.2
391	A-B2-C1-E1-F2-G2-G1-I1-K11-K12-L2-Z	68.5
392	A-B2-C1-E1-F2-G2-G1-I1-K2-J6-J7-L1-Z	68.1
393	A-B2-C1-E1-F2-G2-G1-I1-K2-J6-J5-J8-K5-L1-Z	70.9
394	A-B2-C1-E1-F2-G2-G1-I1-K2-K3-K12-L2-Z	65.1
395	A-B2-C1-E1-F2-G4-G3-G1-I1-K11-K12-L2-Z	68.8
396	A-B2-C1-E1-F2-G4-G3-G1-I1-K2-J6-J7-L1-Z	68.4
397	A-B2-C1-E1-F2-G4-G3-G1-I1-K2-J6-J5-J8-K5-L1-Z	71.2
398	A-B2-C1-E1-F2-G4-G3-G1-I1-K2-K3-K12-L2-Z	65.4
399	A-B2-C1-E1-F2-G4-G51-G52-I3-J1-J7-L1-Z	57.1
400	A-B2-C1-E1-F2-G4-G51-G52-I3-J1-J5-J8-K5-L1-Z	59.9
401	A-B2-C1-E1-F2-G4-G51-G52-I3-J21-J22-J3-J4-J8-K5-L1-Z	61.6
402	A-B2-C1-E1-F2-G4-G51-G52-I3-J21-J22-J3-J4-J5-J7-L1-Z	62.8
403	A-B2-C1-E1-F2-G4-G51-G52-I3-J21-J22-J3-K4-K5-L1-Z	59.8
404	A-B2-C1-E1-F2-G4-G51-I2-J1-J7-L1-Z	56.3
405	A-B2-C1-E1-F2-G4-G51-I2-J1-J5-J8-K5-L1-Z	59.1
406	A-B2-C1-E1-F2-G4-G51-I2-J21-J22-J3-J4-J8-K5-L1-Z	60.8
407	A-B2-C1-E1-F2-G4-G51-I2-J21-J22-J3-J4-J5-J7-L1-Z	62.0
408	A-B2-C1-E1-F2-G4-G51-I2-J21-J22-J3-K4-K5-L1-Z	59.0

End of Table



**Appendix E**  
**Environmental Data for Evaluation Alternative Routes**

THIS PAGE LEFT BLANK INTENTIONALLY

**Table 7-2. Environmental Data for Alternative Route Evaluation  
Sand Lake—Solstice 345 kV Transmission Line Project**

Alternative Route Number	1	2	3	4	5	6	7	8	9	10	11
Length of alternative route	273,347	279,360	263,845	265,609	280,351	289,401	295,413	279,899	338,589	336,544	351,287
Length of route parallel to existing electric transmission lines	22,117	8,393	36,604	10,149	23,673	50,108	36,384	64,596	58,317	23,841	37,565
Length of route parallel to railroads	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to existing public roads/highways	20,823	21,632	15,673	16,481	15,673	20,823	21,632	15,673	7,520	16,481	15,673
Length of route parallel to pipelines <sup>1</sup>	8,174	8,174	8,174	9,322	9,322	13,684	13,684	13,684	8,825	8,825	8,825
Length of route parallel to apparent property boundaries	27,198	24,489	24,489	46,624	49,332	26,617	23,908	23,908	74,093	48,671	51,379
Total length of route parallel to existing compatible rights-of-way	63,082	47,458	69,710	65,199	81,823	90,492	74,868	97,121	132,874	81,938	97,562
Number of habitable structures within 500 feet of the route centerline <sup>1</sup>	3	3	3	4	4	4	4	4	4	4	4
Number of parks or recreational areas within 1,000 feet of the route centerline <sup>2</sup>	0	0	0	0	0	0	0	0	0	0	0
Length of the route across parks/recreational areas	0	0	0	0	0	0	0	0	0	0	0
Length of route through commercial/industrial areas	13,990	14,194	14,249	14,326	14,604	14,789	14,993	15,048	15,457	15,864	16,141
Length of the route across cropland/hay meadow	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233
Length across rangeland/pasture	239,451	239,114	232,330	221,092	241,057	251,390	251,053	244,269	279,146	284,310	304,275
Length of route across agricultural cropland with mobile irrigation systems <sup>3</sup>	0	0	0	0	0	0	0	0	0	0	0
Length of route across upland woodlands	0	0	0	0	0	0	0	0	0	0	0
Length of route across riparian areas	17,149	19,780	14,607	24,012	22,027	20,466	23,097	17,923	36,707	28,959	26,974
Length of route across potential wetlands	1,440	4,954	1,343	4,861	1,347	1,440	4,954	1,343	5,798	6,094	2,580
Number of stream crossings by the route	13	13	13	17	17	16	16	16	18	18	18
Length of route parallel to streams (within 100 feet)	0	0	0	783	783	581	581	581	1,120	1,042	1,042
Length across lakes or ponds (open waters)	83	83	83	83	83	83	83	83	219	83	83
Number of known rare/unique plant locations within the right-of-way	1	1	1	1	1	1	1	1	2	1	1
Length of route through known habitat of endangered or threatened species	63	63	63	63	63	63	63	63	63	63	63
Number of recorded cultural resource sites crossed by the route	1	1	1	0	0	0	0	0	0	0	0
Number of recorded cultural resources within 1,000 feet of the route centerline	4	4	4	2	2	2	2	2	2	2	2
Length of route across areas of high archaeological/historical site potential	53,146	50,280	53,146	71,534	74,400	70,492	67,626	70,492	73,304	65,493	68,359
Number of private airstrips within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with at least one runway more than 3,200 feet in length within 20,000 feet of route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of heliports located within 5,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of commercial AM radio transmitters located within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline	1	1	1	2	2	4	4	4	2	2	2
Number of U.S. or State Highway crossings by the route	3	3	3	3	3	3	3	3	3	3	3
Number of Farm to Market (F.M.) county roads, or other street crossings by the route	9	9	9	12	12	9	9	9	10	9	9
Estimated length of right-of-way within foreground visual zone of U.S. and State Highways	20,050	20,050	20,050	21,616	21,616	21,616	21,616	21,616	31,476	21,616	21,616
Estimated length of right-of-way within foreground visual zone of park/recreational areas	0	0	0	0	0	0	0	0	0	0	0

**Note.** All length measurements in feet. All linear measurements were obtained from the National Agricultural Imagery Program digital ortho imagery flown in 2016-2017 with the exception of areas of high archaeological/historical site potential which were measured from USGS Topographic Quadrangles. The aerial photograph has a provided accuracy of +/- 30 feet. <sup>1</sup>Structures normally inhabited by humans on a daily or regular basis. Habitable structures include but are not limited to a single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, churches, hospitals, nursing homes, and schools. <sup>2</sup>Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church. <sup>3</sup>Believed to be systems no longer in use.

\* - Not included in length of route parallel to existing compatible rights-of-way

**Table 7-2. Environmental Data for Alternative Route Evaluation  
Sand Lake—Solstice 345 kV Transmission Line Project**

Alternative Route Number	12	13	14	15	16	17	18	19	20	21	22
Length of alternative route	320,914	255,339	270,081	279,131	285,143	289,629	246,581	261,324	270,373	276,386	260,871
Length of route parallel to existing electric transmission lines	59,872	0	13,724	39,959	26,235	54,446	0	13,724	39,959	26,235	54,446
Length of route parallel to railroads	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to existing public roads/highways	7,520	16,481	15,673	20,823	21,632	15,673	16,481	15,673	20,823	21,632	15,673
Length of route parallel to pipelines <sup>1</sup>	8,825	8,748	8,748	13,110	13,110	13,110	670	670	5,032	5,032	5,032
Length of route parallel to apparent property boundaries	46,671	55,190	57,898	35,182	32,474	32,474	53,125	55,833	33,117	30,409	30,409
Total length of route parallel to existing compatible rights-of-way	109,007	64,616	80,239	88,909	73,285	95,537	62,550	78,174	86,843	71,220	93,472
Number of habitable structures within 500 feet of the route centerline <sup>2</sup>	4	4	4	4	4	4	3	3	3	3	3
Number of parks or recreational areas within 1,000 feet of the route centerline <sup>2</sup>	0	0	0	0	0	0	0	0	0	0	0
Length of the route across parks/recreational areas	0	0	0	0	0	0	0	0	0	0	0
Length of route through commercial/industrial areas	15,474	13,699	13,977	14,162	14,366	14,421	11,888	12,166	12,351	12,555	12,610
Length of the route across cropland/hay meadow	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233
Length across rangeland/pasture	272,747	215,803	235,767	246,100	245,763	238,979	207,862	227,827	238,159	237,823	231,038
Length of route across agricultural cropland with mobile irrigation systems <sup>3</sup>	0	0	0	0	0	0	0	0	0	0	0
Length of route across upland woodlands	0	0	0	0	0	0	0	0	0	0	0
Length of route across riparian areas	28,775	19,658	17,673	16,112	18,743	13,569	19,869	17,884	16,323	18,954	13,780
Length of route across potential wetlands	2,589	4,861	1,347	1,440	4,954	1,343	5,644	2,130	2,223	5,737	2,126
Number of stream crossings by the route	22	18	18	17	17	17	15	15	14	14	14
Length of route parallel to streams (within 100 feet)	1,366	783	783	581	581	581	1,001	1,001	799	799	799
Length across lakes or ponds (open waters)	96	83	83	83	83	83	83	83	83	83	83
Number of known rare/unique plant locations within the right-of-way	1	1	1	1	1	1	1	1	1	1	1
Length of route through known habitat of endangered or threatened species	63	63	63	63	63	63	63	63	63	63	63
Number of recorded cultural resource sites crossed by the route	1	0	0	0	0	0	0	0	0	0	0
Number of recorded cultural resources within 1,000 feet of the route centerline	3	2	2	2	2	2	3	3	3	3	3
Length of route across areas of high archaeological/historical site potential	73,994	69,037	71,903	67,996	65,129	67,996	64,131	66,997	63,090	60,223	63,090
Number of private airstrips within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with at least one runway more than 3,200 feet in length within 20,000 feet of route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of heliports located within 5,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of commercial AM radio transmitters located within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of FM microwave and other electronic installations within 2,000 feet of the route centerline	2	2	2	4	4	4	0	0	2	2	2
Number of U.S. or State Highway crossings by the route	3	3	3	3	3	3	3	3	3	3	3
Number of Farm to Market (F.M.) county roads, or other street crossings by the route	9	12	12	9	9	9	13	13	10	10	10
Estimated length of right-of-way within foreground visual zone of U.S. and State Highways	25,124	21,616	21,616	21,616	21,616	21,616	20,298	20,298	20,298	20,298	20,298
Estimated length of right-of-way within foreground visual zone of park/recreational areas	0	0	0	0	0	0	0	0	0	0	0

**Note:** All length measurements in feet. All linear measurements were obtained from the National Agricultural Imagery Program digital ortho imagery flown in 2016-2017 with the exception of areas of high archaeological/historical site potential which were measured from USGS Topographic Quadrangles. The aerial photograph has a provided accuracy of +/- 30 feet. <sup>1</sup>Structures normally inhabited by humans on a daily or regular basis. Habitable structures include but are not limited to a single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, churches, hospitals, nursing homes, and schools. <sup>2</sup>Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church. <sup>3</sup>Believed to be systems no longer in use.

\* - Not included in length of route parallel to existing compatible rights-of-way



**Table 7-2. Environmental Data for Alternative Route Evaluation  
Sand Lake—Solstice 345 kV Transmission Line Project**

Alternative Route Number	23	24	25	26	27	28	29	30	31	32	33
Length of alternative route	242,231	256,974	266,023	272,036	256,522	305,614	303,569	318,311	287,938	307,195	305,150
Length of route parallel to existing electric transmission lines	10,149	23,873	50,108	36,384	64,596	58,317	23,841	37,565	59,872	58,317	23,841
Length of route parallel to railroads	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to existing public roads/highways	16,481	15,673	20,823	21,632	15,673	7,520	16,481	15,673	7,520	7,520	16,481
Length of route parallel to pipelines <sup>1</sup>	1,244	1,244	5,606	5,606	5,606	747	747	747	747	747	747
Length of route parallel to apparent property boundaries	44,559	47,267	24,551	21,843	21,843	72,028	46,606	49,314	46,606	72,028	46,606
Total length of route parallel to existing compatible rights-of-way	64,134	79,757	88,427	72,803	95,055	130,809	79,873	95,496	106,942	130,809	79,873
Number of habitable structures within 500 feet of the route centerline <sup>1</sup>	3	3	3	3	3	3	3	3	3	3	3
Number of parks or recreational areas within 1,000 feet of the route centerline <sup>2</sup>	0	0	0	0	0	0	0	0	0	0	0
Length of the route across parks/recreational areas	0	0	0	0	0	0	0	0	0	0	0
Length of route through commercial/industrial areas	11,590	11,867	12,053	12,256	12,312	12,267	12,643	12,921	12,253	12,221	12,597
Length of the route across cropland/hay meadow	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233
Length across rangeland/pasture	199,579	219,544	229,876	229,540	222,755	248,991	254,155	274,120	242,592	250,392	255,557
Length of route across agricultural cropland with mobile irrigation systems <sup>3</sup>	0	0	0	0	0	0	0	0	0	0	0
Length of route across upland woodlands	0	0	0	0	0	0	0	0	0	0	0
Length of route across riparian areas	24,101	22,116	20,555	23,186	18,012	36,532	28,784	26,799	28,600	36,757	29,010
Length of route across potential wetlands	5,644	2,130	2,223	5,737	2,126	6,372	6,669	3,155	3,164	6,372	6,669
Number of stream crossings by the route	14	14	13	13	13	15	15	15	19	15	15
Length of route parallel to streams (within 100 feet)	1,001	1,001	799	799	799	1,338	1,260	1,260	1,584	1,338	1,260
Length across lakes or ponds (open waters)	83	83	83	83	83	219	83	83	96	219	83
Number of known rare/unique plant locations within the right-of-way	1	1	1	1	1	2	1	1	1	2	1
Length of route through known habitat of endangered or threatened species	63	63	63	63	63	63	63	63	63	63	63
Number of recorded cultural resource sites crossed by the route	0	0	0	0	0	0	0	0	1	0	0
Number of recorded cultural resources within 1,000 feet of the route centerline	3	3	3	3	3	3	3	3	4	3	3
Length of route across areas of high archaeological/historical site potential	62,797	65,663	61,755	58,889	61,755	64,567	56,756	59,622	65,257	64,567	56,756
Number of private airstrips within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with at least one runway more than 3,200 feet in length within 20,000 feet of route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of heliports located within 5,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of commercial AM radio transmitters located within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline	0	0	2	2	2	0	0	0	0	0	0
Number of U.S. or State Highway crossings by the route	3	3	3	3	3	3	3	3	3	3	3
Number of Farm to Market (F.M.) county roads, or other street crossings by the route	13	13	10	10	10	11	10	10	10	11	10
Estimated length of right-of-way within foreground visual zone of U.S. and State Highways	20,298	20,298	20,298	20,298	20,298	30,159	20,298	20,298	23,806	30,159	20,298
Estimated length of right-of-way within foreground visual zone of park/recreational areas	0	0	0	0	0	0	0	0	0	0	0

**Note:** All length measurements in feet. All linear measurements were obtained from the National Agricultural Imagery Program digital ortho imagery flown in 2016-2017 with the exception of areas of high archaeological/historical site potential which were measured from USGS Topographic Quadrangles. The aerial photograph has a provided accuracy of +/- 30 feet. <sup>1</sup>Structures normally inhabited by humans on a daily or regular basis. Habitable structures include but are not limited to a single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, churches, hospitals, nursing homes, and schools. <sup>2</sup>Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church.

<sup>3</sup>Believed to be systems no longer in use.

\* - Not included in length of route parallel to existing compatible rights-of-way.

**Table 7-2. Environmental Data for Alternative Route Evaluation  
Sand Lake—Solstice 345 kV Transmission Line Project**

Alternative Route Number	34	35	36	37	38	39	40	41	42	43	44
Length of alternative route	319,892	289,519	245,678	260,421	269,470	275,483	259,969	241,329	256,071	265,121	271,133
Length of route parallel to existing electric transmission lines	37,565	59,672	0	13,724	39,959	26,235	54,446	10,149	23,873	50,108	36,384
Length of route parallel to railroads	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to existing public roads/highways	15,673	7,520	16,481	15,673	20,823	21,632	15,673	16,481	15,673	20,823	21,632
Length of route parallel to pipelines <sup>1</sup>	747	747	670	670	5,032	5,032	5,032	1,244	1,244	5,606	5,606
Length of route parallel to apparent property boundaries	49,314	46,606	53,125	55,833	33,117	30,409	30,409	44,559	47,267	24,551	21,843
Total length of route parallel to existing compatible rights-of-way	95,496	106,942	62,550	78,174	66,843	71,220	93,472	64,134	79,757	88,427	72,803
Number of habitable structures within 500 feet of the route centerline <sup>1</sup>	3	3	3	3	3	3	3	3	3	3	3
Number of parks or recreational areas within 1,000 feet of the route centerline <sup>2</sup>	0	0	0	0	0	0	0	0	0	0	0
Length of the route across parks/recreational areas	0	0	0	0	0	0	0	0	0	0	0
Length of route through commercial/industrial areas	12,875	12,207	11,635	11,913	12,098	12,302	12,357	11,337	11,614	11,800	12,003
Length of the route across cropland/hay meadow	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233
Length across rangeland/pasture	275,521	243,994	206,987	226,952	237,284	236,948	230,163	198,704	218,669	229,001	228,665
Length of route across agricultural cropland with mobile irrigation systems <sup>3</sup>	0	0	0	0	0	0	0	0	0	0	0
Length of route across upland woodlands	0	0	0	0	0	0	0	0	0	0	0
Length of route across riparian areas	27,024	28,825	20,095	18,110	16,548	19,179	14,006	24,327	22,341	20,780	23,411
Length of route across potential wetlands	3,155	3,164	5,644	2,130	2,223	5,737	2,126	5,644	2,130	2,223	5,737
Number of stream crossings by the route	15	19	15	15	14	14	14	14	14	13	13
Length of route parallel to streams (within 100 feet)	1,260	1,584	1,001	1,001	799	799	799	1,001	1,001	799	799
Length across lakes or ponds (open waters)	83	96	83	83	83	83	83	83	83	83	83
Number of known rare/unique plant locations within the right-of-way	1	1	1	1	1	1	1	1	1	1	1
Length of route through known habitat of endangered or threatened species	63	63	63	63	63	63	63	63	63	63	63
Number of recorded cultural resource sites crossed by the route	0	1	0	0	0	0	0	0	0	0	0
Number of recorded cultural resources within 1,000 feet of the route centerline	3	4	3	3	3	3	3	3	3	3	3
Length of route across areas of high archaeological/historical site potential	59,622	65,257	64,131	66,997	63,090	60,223	63,090	62,797	65,663	61,755	58,889
Number of private airstrips within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with at least one runway more than 3,200 feet in length within 20,000 feet of route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of heliports located within 5,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of commercial AM radio transmitters located within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline	0	0	0	0	2	2	2	0	0	2	2
Number of U.S. or State Highway crossings by the route	3	3	3	3	3	3	3	3	3	3	3
Number of Farm to Market (F.M.) county roads, or other street crossings by the route	10	10	13	13	10	10	10	13	13	10	10
Estimated length of right-of-way within foreground visual zone of U.S. and State Highways	20,298	23,806	20,298	20,298	20,298	20,298	20,298	20,298	20,298	20,298	20,298
Estimated length of right-of-way within foreground visual zone of park/recreational areas	0	0	0	0	0	0	0	0	0	0	0

**Note:** All length measurements in feet. All linear measurements were obtained from the National Agricultural Imagery Program digital ortho imagery flown in 2016-2017 with the exception of areas of high archaeological/historical site potential which were measured from USGS Topographic Quadrangles. The aerial photograph has a provided accuracy of +/- 30 feet. <sup>1</sup>Structures normally inhabited by humans on a daily or regular basis. Habitable structures include but are not limited to a single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, churches, hospitals, nursing homes, and schools. <sup>2</sup>Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church. <sup>3</sup>Believed to be systems no longer in use.

\* - Not included in length of route parallel to existing compatible rights-of-way

**Table 7-2. Environmental Data for Alternative Route Evaluation  
Sand Lake—Solstice 345 kV Transmission Line Project**

Alternative Route Number	45	46	47	48	49	50	51	52	53	54	55
Length of alternative route	255,619	289,870	287,825	302,567	272,194	285,045	299,787	308,837	314,850	299,335	280,695
Length of route parallel to existing electric transmission lines	64,596	58,317	23,841	37,565	59,872	0	13,724	39,959	26,235	54,446	10,149
Length of route parallel to railroads	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to existing public roads/highways	15,673	8,038	16,999	16,190	8,038	16,999	16,190	21,340	22,149	16,190	16,999
Length of route parallel to pipelines <sup>1</sup>	5,606	747	747	747	747	670	670	5,032	5,032	5,032	1,244
Length of route parallel to apparent property boundaries	21,843	78,943	53,521	56,229	53,521	73,179	75,887	53,171	50,463	50,463	64,613
Total length of route parallel to existing compatible rights-of-way	95,055	138,241	87,305	102,928	114,374	83,122	98,745	107,415	91,791	114,044	84,705
Number of habitable structures within 500 feet of the route centerline <sup>2</sup>	3	2	2	2	2	2	2	2	2	2	2
Number of parks or recreational areas within 1,000 feet of the route centerline <sup>2</sup>	0	0	0	0	0	0	0	0	0	0	0
Length of the route across parks/recreational areas	0	0	0	0	0	0	0	0	0	0	0
Length of route through commercial/industrial areas	12,059	10,422	10,799	11,076	10,409	12,277	12,555	12,740	12,944	12,999	11,979
Length of the route across cropland/hay meadow	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233
Length across rangeland/pasture	221,860	237,747	242,911	262,876	231,348	245,003	264,967	275,300	274,963	268,179	236,720
Length of route across agricultural cropland with mobile irrigation systems <sup>3</sup>	0	0	0	0	0	0	0	0	0	0	0
Length of route across upland woodlands	0	0	0	0	0	0	0	0	0	0	0
Length of route across riparian areas	18,237	34,721	26,973	24,968	26,789	21,648	19,653	18,102	20,733	15,559	25,880
Length of route across potential wetlands	2,126	5,528	5,624	2,310	2,319	4,800	1,285	1,378	4,893	1,281	4,800
Number of stream crossings by the route	13	16	16	16	20	16	16	15	15	15	15
Length of route parallel to streams (within 100 feet)	799	3,203	3,125	3,125	3,450	2,866	2,866	2,665	2,665	2,665	2,866
Length across lakes or ponds (open waters)	83	219	83	83	96	83	83	83	83	83	83
Number of known rare/unique plant locations within the right-of-way	1	4	3	3	3	3	3	3	3	3	3
Length of route through known habitat of endangered or threatened species	63	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532
Number of recorded cultural resource sites crossed by the route	0	1	1	1	2	1	1	1	1	1	1
Number of recorded cultural resources within 1,000 feet of the route centerline	3	3	3	3	4	3	3	3	3	3	3
Length of route across areas of high archaeological/historical site potential	61,755	72,502	64,691	67,557	73,191	72,066	74,932	71,024	68,158	71,024	70,731
Number of private airstrips within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with at least one runway more than 3,200 feet in length within 20,000 feet of route centerline	0	1	1	1	1	1	1	1	1	1	1
Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of heliports located within 5,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of commercial AM radio transmitters located within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline	2	1	1	1	1	1	1	3	3	3	1
Number of U.S. or State Highway crossings by the route	3	3	3	3	3	3	3	3	3	3	3
Number of Farm to Market (F.M.) county roads or other street crossings by the route	10	9	8	8	8	11	11	8	8	8	11
Estimated length of right-of-way within foreground visual zone of U.S. and State Highways	20,298	32,979	23,119	23,119	28,627	23,119	23,119	23,119	23,119	23,119	23,119
Estimated length of right-of-way within foreground visual zone of parks/recreational areas	0	0	0	0	0	0	0	0	0	0	0

**Note:** All length measurements in feet. All linear measurements were obtained from the National Agricultural Imagery Program digital ortho imagery flown in 2016-2017 with the exception of areas of high archaeological/historical site potential which were measured from USGS Topographic Quadrangles. The aerial photograph has a provided accuracy of +/- 30 feet. <sup>1</sup>Structures normally inhabited by humans on a daily or regular basis. Habitable structures include but are not limited to a single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, churches, hospitals, nursing homes, and schools. <sup>2</sup>Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church. <sup>3</sup>Believed to be systems no longer in use.

\* - Not included in length of route parallel to existing compatible rights-of-way

**Table 7-2. Environmental Data for Alternative Route Evaluation  
Sand Lake—Solstice 345 kV Transmission Line Project**

Alternative Route Number	56	57	58	59	60	61	62	63	64	65	66
Length of alternative route	295,438	304,487	310,500	294,986	269,249	283,991	293,041	299,054	283,539	264,899	279,642
Length of route parallel to existing electric transmission lines	23,873	50,108	36,384	64,596	7,925	21,649	47,884	34,159	62,371	18,074	31,798
Length of route parallel to railroads	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to existing public roads/highways	16,190	21,340	22,149	16,190	16,481	15,673	20,823	21,632	15,673	16,481	15,673
Length of route parallel to pipelines <sup>1</sup>	1,244	5,606	5,606	5,606	13,237	13,237	17,599	17,599	17,599	13,811	13,811
Length of route parallel to apparent property boundaries	67,321	44,606	41,897	41,897	51,080	53,788	31,072	28,364	28,364	42,514	45,222
Total length of route parallel to existing compatible rights-of-way	100,329	108,998	93,375	115,627	68,430	84,054	92,723	77,100	99,352	70,014	85,637
Number of habitable structures within 500 feet of the route centerline <sup>2</sup>	2	2	2	2	2	2	2	2	2	2	2
Number of parks or recreational areas within 1,000 feet of the route centerline <sup>2</sup>	0	0	0	0	0	0	0	0	0	0	0
Length of the route across parks/recreational areas	0	0	0	0	0	0	0	0	0	0	0
Length of route through commercial/industrial areas	12,256	12,441	12,645	12,701	12,291	12,568	12,753	12,957	13,012	11,992	12,269
Length of the route across cropland/hay meadow	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233
Length across rangeland/pasture	256,684	267,017	266,680	259,696	229,340	249,304	259,637	259,306	252,516	221,057	241,021
Length of route across agricultural cropland with mobile irrigation systems <sup>3</sup>	0	0	0	0	0	0	0	0	0	0	0
Length of route across upland woodlands	0	0	0	0	0	0	0	0	0	0	0
Length of route across riparian areas	23,895	22,334	24,955	19,791	20,869	18,884	17,322	19,954	14,780	25,101	23,115
Length of route across potential wetlands	1,285	1,376	4,893	1,281	5,433	1,919	2,012	5,526	1,914	5,433	1,919
Number of stream crossings by the route	15	14	14	14	13	13	12	12	12	12	12
Length of route parallel to streams (within 100 feet)	2,866	2,865	2,865	2,865	2,011	2,011	0	0	0	2,011	2,011
Length across lakes or ponds (open waters)	83	83	83	83	83	83	83	83	83	83	83
Number of known rare/unique plant locations within the right-of-way	3	3	3	3	3	3	3	3	3	3	3
Length of route through known habitat of endangered or threatened species	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532
Number of recorded cultural resource sites crossed by the route	1	1	1	1	1	1	1	1	1	1	1
Number of recorded cultural resources within 1,000 feet of the route centerline	3	3	3	3	3	3	3	3	3	3	3
Length of route across areas of high archaeological/historical site potential	73,598	69,690	66,823	69,690	65,743	68,609	64,701	61,835	64,701	64,408	67,274
Number of private airstrips within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with at least one runway more than 3,200 feet in length within 20,000 feet of route centerline	1	1	1	1	1	1	1	1	1	1	1
Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of heliports located within 5,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of commercial AM radio transmitters located within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline	1	3	3	3	1	1	3	3	3	1	1
Number of U.S. or State Highway crossings by the route	3	3	3	3	3	3	3	3	3	3	3
Number of Farm to Market (F.M.) county roads, or other street crossings by the route	11	8	8	8	11	11	8	8	8	11	11
Estimated length of right-of-way within foreground visual zone of U.S. and State Highways	23,119	23,119	23,119	23,119	23,119	23,119	23,119	23,119	23,119	23,119	23,119
Estimated length of right-of-way within foreground visual zone of park/recreational areas	0	0	0	0	0	0	0	0	0	0	0

**Note:** All length measurements in feet. All linear measurements were obtained from the National Agricultural Imagery Program digital ortho imagery flown in 2016-2017 with the exception of areas of high archaeological/historical site potential which were measured from USGS Topographic Quadrangles. The aerial photograph has a provided accuracy of +/- 30 feet. <sup>1</sup>Structures normally inhabited by humans on a daily or regular basis. Habitable structures include but are not limited to a single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, churches, hospitals, nursing homes, and schools. <sup>2</sup>Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church. <sup>3</sup>Believed to be systems no longer in use.

\* - Not included in length of route parallel to existing compatible rights-of-way



**Table 7-2. Environmental Data for Alternative Route Evaluation  
Sand Lake—Solstice 345 kV Transmission Line Project**

Alternative Route Number	67	68	69	70	71	72	73	74	75	76	77
Length of alternative route	288,691	294,704	279,190	328,282	326,237	340,979	310,606	329,863	327,817	342,560	312,187
Length of route parallel to existing electric transmission lines	58,033	44,309	72,520	66,241	31,766	45,490	67,796	66,241	31,766	45,490	67,796
Length of route parallel to railroads	0	0	0	0	0	0	0	0	0	0	0
Length of route parallel to existing public roads/highways	20,823	21,632	15,673	7,520	16,481	15,673	7,520	7,520	16,481	15,673	7,520
Length of route parallel to pipelines <sup>1</sup>	16,173	18,173	18,173	13,314	13,314	13,314	13,314	13,314	13,314	13,314	13,314
Length of route parallel to apparent property boundaries	22,507	19,796	19,796	69,983	44,561	47,269	44,561	69,983	44,561	47,269	44,561
Total length of route parallel to existing compatible rights-of-way	94,307	78,683	100,935	136,689	85,753	101,376	112,822	136,689	85,753	101,376	112,822
Number of habitable structures within 500 feet of the route centerline <sup>1</sup>	2	2	2	2	2	2	2	2	2	2	2
Number of parks or recreational areas within 1,000 feet of the route centerline <sup>2</sup>	0	0	0	0	0	0	0	0	0	0	0
Length of the route across parks/recreational areas	0	0	0	0	0	0	0	0	0	0	0
Length of route through commercial/industrial areas	12,455	12,659	12,714	12,669	13,045	13,323	12,655	12,623	13,000	13,277	12,609
Length of the route across cropland/hay meadow	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233
Length across rangeland/pasture	251,354	251,017	244,233	270,468	275,633	295,597	264,070	271,870	277,034	296,999	265,471
Length of route across agricultural cropland with mobile irrigation systems <sup>3</sup>	0	0	0	0	0	0	0	0	0	0	0
Length of route across upland woodlands	0	0	0	0	0	0	0	0	0	0	0
Length of route across riparian areas	21,554	24,185	19,012	37,531	29,784	27,799	29,599	37,757	30,009	28,024	29,825
Length of route across potential wetlands	2,012	5,526	1,914	6,161	6,458	2,943	2,953	6,161	6,458	2,943	2,953
Number of stream crossings by the route	11	11	11	13	13	13	17	13	13	13	17
Length of route parallel to streams (within 100 feet)	0	0	0	538	461	461	785	538	461	461	785
Length across lakes or ponds (open waters)	83	83	83	219	83	83	96	219	83	83	96
Number of known rare/unique plant locations within the right-of-way	3	3	3	4	3	3	3	4	3	3	3
Length of route through known habitat of endangered or threatened species	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532	10,532
Number of recorded cultural resource sites crossed by the route	1	1	1	1	1	1	2	1	1	1	2
Number of recorded cultural resources within 1,000 feet of the route centerline	3	3	3	3	3	3	4	3	3	3	4
Length of route across areas of high archaeological/historical site potential	63,366	60,500	63,366	66,178	58,367	61,234	66,868	66,178	58,367	61,234	66,868
Number of private airstrips within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of FAA-registered airports with at least one runway more than 3,200 feet in length within 20,000 feet of route centerline	1	1	1	1	1	1	1	1	1	1	1
Number of FAA-registered airports with no runway greater than 3,200 feet in length within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of heliports located within 5,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of commercial AM radio transmitters located within 10,000 feet of the route centerline	0	0	0	0	0	0	0	0	0	0	0
Number of FM, microwave and other electronic installations within 2,000 feet of the route centerline	3	3	3	1	1	1	1	1	1	1	1
Number of U.S. or State Highway crossings by the route	3	3	3	3	3	3	3	3	3	3	3
Number of Farm to Market (F.M.) county roads, or other street crossings by the route	8	8	8	9	8	8	8	9	8	8	8
Estimated length of right-of-way within foreground visual zone of U.S. and State Highways	23,119	23,119	23,119	32,979	23,119	23,119	26,627	32,979	23,119	23,119	26,627
Estimated length of right-of-way within foreground visual zone of park/recreational areas	0	0	0	0	0	0	0	0	0	0	0

**Note:** All length measurements in feet. All linear measurements were obtained from the National Agricultural Imagery Program digital ortho imagery flown in 2016-2017 with the exception of areas of high archaeological/historical site potential which were measured from USGS Topographic Quadrangles. The aerial photograph has a provided accuracy of +/- 30 feet. <sup>1</sup>Structures normally inhabited by humans on a daily or regular basis. Habitable structures include but are not limited to a single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, churches, hospitals, nursing homes, and schools. <sup>2</sup>Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church. <sup>3</sup>Believed to be systems no longer in use.

\* - Not included in length of route parallel to existing compatible rights-of-way